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Establishing the Situated Features Associated with Perceived Stress

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Running head. Categorizing Stressful Situations

Abstract

We propose that the domain general process of categorization contributes to the perception of stress. When a situation contains features associated with stressful experiences, it is categorized as stressful. From the perspective of situated cognition, the features used to categorize experiences as stressful are the features typically true of stressful situations. To test this hypothesis, we asked participants to evaluate the perceived stress of 572 imagined situations, and to also evaluate each situation for how much it possessed 19 features potentially associated with stressful situations and their processing (e.g., self-threat, familiarity, visual imagery, outcome certainty). Following variable reduction through factor analysis, a core set of 8 features associated with stressful situations—expectation violation, self-threat, coping efficacy, bodily experience, arousal, negative valence, positive valence, and perseveration—all loaded on a single Core Stress Features factor. In a multilevel model, this factor and an Imagery factor explained 88% of the variance in judgments of perceived stress, with significant random effects reflecting differences in how individual participants categorized stress. These results support the hypothesis that people categorize situations as stressful to the extent that typical features of stressful situations are present. To our knowledge, this is the first attempt to establish a comprehensive set of features that predicts perceived stress.

Key words: stress; perceived stress; categorization; stress categorization; situated cognition; appraisal

The Importance of Perceived stress

The distinction between stressful life events vs. perceived stress has played a central role in the measurement of stress (e.g., Cohen, Kessler, & Gordon, 1995; Monroe, 2008). From an environmental perspective, an individual's stress can be measured as the number of stressful life events that he or she encounters in the world, using instruments such as the Social Readjustment Rating Scale (Holmes & Rahe, 1967) and the Life Events and Difficulties Schedule (Brown & Harris, 1978). From a psychological perspective, an individual's stress can be measured as how much stress he or she perceives in their experience, using instruments such as the Perceived Stress Scale (Cohen, Kamarck, & Mermelstein, 1983) and the Perceived Stress Questionnaire (Levenstein et al., 1993). Although both environmental and psychological measures predict the negative consequences of stress, such as illness (e.g., Cohen, Tyrrell, & Smith, 1993), we focus here on the psychological contribution.

Since the advent of appraisal theory (e.g., Lazarus & Folkman, 1984), the importance of perceived stress for mental and physical wellbeing has become well established. Depending on how the same life event is interpreted psychologically, its affective and bodily consequences can vary. Whereas one person might appraise an opportunity for public speaking as a threat, another might appraise the same event as a challenge (e.g., Blascovich, Mendes, Hunter, & Lickel, 2000). Perceived stress is associated with negative health outcomes (e.g., Cohen & Wiliamsen, 1988), and also with various biological markers of stress, such as telomere shortening (Epel et al., 2004) and reduction in hippocampal gray matter (e.g., Gianaros et al., 2007).

The negative health consequences of neuroticism further implicate the importance of perceived stress in health. Neuroticism is typically defined as high stable levels of negative emotion, reflecting the fact that some individuals respond more negatively to negative life events than do others. As much research shows, neuroticism is associated with considerable reductions in both mental and physical wellbeing (Lahey, 2009). Importantly, for our purposes here, individuals who score high on neuroticism tend to experience classic

markers of stress, being more likely to perceive threat and less likely to believe that they can cope with threat effectively (Gunthert, Cohen, & Armeli, 1999). As a result, these individuals tend to experience more stress in response to negative events (Suls, Green, & Hillis, 1998). Finally, perceived stress and neuroticism share common genetic contributions (Reitschel et al., 2014) and are closely related psychometrically (Morgan, Umberson, & Hertzog, 2014). The strong affective responses associated with neuroticism further implicate the importance of psychological factors in the stress that an individual experiences.

Adopting a Categorization Perspective on Stress Perception

To date, research has predominantly examined perceived stress as a predictor, specifically, as a predictor of negative health outcomes (for a brief review, see Monroe, 2008). Conversely, it is important to understand the factors that predict perceived stress, with these factors potentially including cognitive, affective, and bodily processes. Once these predictive factors are established, they can inform how the perception of stress originates, and can be used to motivate interventions that decrease it.

Appraisal theory offers one account that informs the perception of stress (e.g., Lazarus & Folkman, 1984; Lazarus, 1993; Moors, Ellsworth, Scherer, & Frijda, 2013; Roseman, 2011; Scherer, 2001). When difficult life events occur, people often make certain kinds of appraisals about them (e.g., a threat is present, coping ability is low). In turn, these appraisals can cause bodily and affective responses associated with stress (e.g., McEwen, 2007; McEwen & Sapolsky, 1995). In other words, making these appraisals can cause stress responses (but see Moors, 2013; Parkinson, 1997). Once appraisals and stress responses have been produced, the perception of stress results.

We explore a related but different perspective here, drawing on categorization research in cognitive science (e.g., Barsalou, 2012; Barsalou & Hale, 1993; Murphy, 2002; Pothos & Wills, 2011). From this perspective, perceived stress is the result of categorizing the current situation as the kind of situation that has previously been experienced as stressful. Specifically, when the current situation

contains features similar to the features of previous situations experienced as stressful, it is categorized as stressful, too. When it is not similar to the features of these situations, it is categorized in some other way (e.g., a boring event, a fulfilling experience). Once the current situation is categorized as a stressful experience, it becomes perceived as stressful. In the Discussion, we address the relations between stress categorization and stress perception further.

Over time, as experiences of stressful situations accumulate and become integrated in an individual's memory, a category of stressful experiences develops. The representation of this category could be a prototype, a collection of exemplars, a connectionist network, a Bayesian model, etc., or some combination of these representational structures. Although this is an important and interesting issue, the specific kinds of structures representing the category of stressful experiences do not bear on the work reported here. Instead, as described next, we simply focus on *features* of stressful situations that could be incorporated into *any* of these representational approaches.

Once an individual has established a category of stressful situations in memory, it is used to categorize new situations as stressful. Because individuals can differ significantly in the life situations they encounter, together with the resources available for coping with these situations, they are likely to differ in the stressful situations that they experience and establish in memory. As a consequence, the content and organization of stress categories varies between individuals, in turn causing variability in how they categorize future situations as stressful. Situations that one individual categorizes as stressful might not be stressful for another individual, and vice versa. From this perspective, stress perception results from the same basic cognitive mechanisms that underlie all other kinds of categorization (cf. Sanislow et al., 2010).

Adopting a Situated Perspective on Stress Categorization

From the categorization perspective, the features associated with a category play central roles in its processing (e.g., Barsalou, 2012; Murphy, 2002). The category of birds, for example, is associated with features such as feathers, wings, flies, chirps, and nests (McRae, Cree, Seidenberg, & McNorgan, 2005; also see Wu & Barsalou, 2009; Santos, Chaigneau,

Simmons, & Barsalou, 2011). During categorization, these features can be used to identify perceived entities as category members. If an entity is perceived as having feathers, wings, and flying, it might be categorized as a bird; alternatively, if it has wheels, an engine, and a trunk, it might be categorized as a car.

What features are associated with that category of stressful experiences? To the extent that we can establish these features, we can better understand how the perception of stress originates. When people perceive situations as having these features, they are likely to categorize and perceive these situations as stressful.

Certainly, the primary and secondary appraisals associated with stress offer likely features used to categorize stressful situations (e.g., Lazarus & Folkman, 1984; Lazarus, 1993). When situations are associated with a threat (primary appraisal) and poor ability to cope with the threat (secondary appraisal), they are likely to be categorized as stressful. Because threat and poor coping ability are often associated with experiencing stress, these features become associated with the category of stressful situations. Indeed, from the perspective of appraisal theories, these are the defining features of stressful experiences.

Importantly, however, a major theme of categorization research is that the features associated with a category are not merely its defining features, but also typical features and contextual features (e.g., Hampton, 1979; Medin & Schaffer, 1978; Rosch & Mervis, 1975; Smith & Medin, 1981). Important features of birds, for example, do not simply include defining features, such as feathers, but also typical features such as small and sings, and contextual features such as live in nests (cf. Lebois, Wilson-Mendenhall, & Barsalou, 2015).

More recently, much research indicates that category knowledge is situated (e.g., Barsalou, 2003, 2008, 2009, in press; Yeh & Barsalou, 2006). When people represent the category of hammers, for example, they don't simply represent defining features (e.g., handle, head), they also represent features of relevant background situations (e.g., woodshops, nails, boards, hammering actions). In experiments that ask people to produce the features associated with concepts, large numbers of situational features are typically produced (e.g., Barsalou & Wiemer-Hastings, 2005; McRae et al., 2005;

Santos et al., 2011; Wu & Barsalou, 2009). In particular, people produce features for background settings, other agents and objects present, actions and events likely to occur, and a wide variety of internal states experienced, including goals, evaluations, emotions, and interoceptions. In general, considerable evidence has existed for some time that the features associated with a category, not only represent the features of category members, but also the situations in which category members are experienced.

If we generalize this basic finding to the category of stressful experiences, it follows that situational features become associated with the category of stressful experiences, just as for any other category. As a consequence, situational features contribute to stress categorization. To the extent that a situation shares features with situations previously experienced as stressful, it too is categorized as stressful.

Establishing the Features Associated with Stressful Situations

To our knowledge, no previous work has attempted to comprehensively establish the features of situations that predict perceived stress. Thus, the study reported here attempted to do so. We adopted two heuristics for identifying features that people might typically associate with stressful situations. First, we examined the diverse literatures on stress, searching for well-documented features of stressful experiences (e.g., Lazarus, 1993). To the extent that a feature has been frequently associated with stressful experiences in the literature, it is likely to be a typical feature (e.g., features associated with primary and secondary appraisals). Second, we examined the stressful situations catalogued in life events inventories and extracted features that appeared typical of these situations (Adrian, & Hammen, 1993; Almeida, 2005; Almeida, Wethington, & Kessler, 2002; Brown & Harris, 1978; Slavich & Epel, 2010). From assessing these situations, we attempted to establish other features besides appraisals that occur regularly during stressful experiences.

Figure 1 summarizes the features that we identified using these two heuristics, integrated into a global conceptual structure likely to represent stressful situations. As Figure 1 illustrates, we propose that a situation is perceived as stressful when three core conditions are

satisfied: (1) an expectation violation exists, namely, a discrepancy between an expectation and an actual or simulated situation (e.g., Higgins, 1989),¹ (2) a threat to self is experienced (e.g., Lazarus, 1993), and (3) a perceived lack of efficacy exists for acting to remove the expectation violation and the associated threat, which could reflect control, power, self-efficacy, available coping strategies, etc. (e.g., Bandura, 1997; Lazarus, 1993; Roseman, 2011; Scherer, 2001). We assume that these three features of a situation are each necessary for perceiving an experience as stressful, and that, together, they are typically sufficient for producing an experience of psychological stress. Indeed, we would argue that they are defining features of stressful situations.

As Figure 1 further illustrates, once the three basic conditions for perceiving a situation as stressful occur, they produce other important features of stressful situations, in particular, the primary stress responses of negative emotion and bodily states. Appraisal theories similarly assume that initial appraisals can produce other aspects of affective episodes, including motivational, somatic, motor, and affective components (e.g., Moors et al., 2013). The realization that one cannot act to remove a threat increases negative emotion (Lazarus, 1999), and produces activity in peripheral physiological systems (Kemeny, 2003; McEwen & Sapolsky, 1995). From the situated perspective, emotion and peripheral physiology are central aspects of situated activity that become associated with the category of stressful experiences (cf. Barrett, 2006, 2013; Barsalou, 2016; Lebois, Wilson-Mendenhall, Simmons, Barrett, & Barsalou, 2016; Wilson-Mendenhall, Barrett, Simmons, & Barsalou, 2011). During a stressful experience, negative emotion could take the form of anxiety, displeasure, fear, anger, sadness, or a combination thereof, depending on the specifics of the situation. Associated peripheral physiology occurs in the cardiovascular, respiratory, autonomic, endocrine, and immune systems.

Finally, as Figure 1 illustrates, secondary stress responses are likely to occur in stressful situations while attempting to manage the core causes of stress and the immediate affective and bodily responses that follow. Because these secondary responses play central roles in experiencing and coping with stress, they, too, constitute important situated features of stressful situations. In particular, rumination and worry about the stressful situation are likely to persist,

as long as the self-threat, action inefficacy, and associated physiological arousal remain (e.g., Brosschot, Gerin, & Thayer, 2006; Nolen-Hoeksema, Wisco, & Lyubomirsky, 2008; Watkins, 2008). We assume that this type of perseverative thought typically results from experiencing the stressful situation, together with the inability to cope effectively. To the extent that coping responses occur, they too may become established as situational features, along with their consequences (e.g., Lazarus, 1993, 1999). Finally, a wide variety of metacognitions about one's stress responses, regulatory activities, and coping abilities are also likely to occur as situational features (e.g., Beer & Moneta, 2010; Dragan et al., 2012; Wells, 2008).

In summary, Figure 1 integrates features of stressful situations abstracted from the stress literature that are compatible with viewing these situations from the situated perspective. Statistically speaking, we assume that an individual's category of stressful experiences is likely to include these features. Certainly, variations on this feature structure occur, with features varying across situations and individuals. Nevertheless, we propose that Figure 1 includes features that are typically present in situations that people find stressful.

Overview and Predictions

If Figure 1 represents the situated structure of the experiences that an individual has previously categorized as stressful, then this structure should determine people's categorizations of whether situations are stressful or not. To the extent that a situation matches this feature structure, the situation should be categorized as stressful; to the extent that the situation does not match, it should be categorized as not stressful.

To test this general hypothesis, we presented participants with 572 brief descriptions of stressful and non-stressful situations that could occur in their daily lives (e.g., "Your professor just accused you of cheating on an exam"). We then asked participants to judge the perceived stress of each situation, without specifying what we meant as stress, leaving it open-ended. To assess whether the specific features in Figure 1 are associated with stressful situations, we also asked participants to evaluate how much each situation they evaluated contained an expectation

violation, self-threat, action inefficacy, negative affect, arousal, and perseverative thought.

If the situated features of stress in Figure 1 provide a good account of the experiences that an individual has categorized as stressful, then memories of stressful situations should contain the features embedded in this structure. Moreover, prototypical memories of stress should tend to have high values for these features (e.g., high threat, high efficacy, high arousal), whereas atypical memories should tend to have low values (e.g., low threat, low efficacy, low arousal: cf. Barsalou, 1985; Wilson-Mendenhall, Barrett, & Barsalou, 2014). As a result, participants should judge situations with high values as stressful, and situations with low values as non-stressful. Furthermore, we predicted that these features would be highly inter-correlated, together constituting a unitary construct of stress. When people experience a situation as stressful, all these features should tend to be present as a group; analogously, when a situation is not stressful, these features should tend to be absent as a group.

Four additional kinds of features noted in various literatures could also potentially influence the perceived stress of a situation: familiarity, imagery, realism, and certainty. Notably, these additional features generally constitute cognitive aspects of how representations of stressful situations are processed, rather than being features of stressful situations themselves. First, familiarity and past experience with a stressor could be correlated either positively or negatively with its perceived stress (Bandura, 1997). The more often people fail to effectively manage a stressor, the more stressful it may seem. Alternatively, increased familiarity with a stressor may enhance one's belief that it can be handled effectively, making it seem less stressful. Second, imagery could be related to perceived stress (D'Argembeau, & Van der Linden, 2006). As visual imagery, auditory imagery, motor imagery, and bodily experience increase while imagining a stressor, the stress experienced could increase as well.² Third, the plausibility and subjective realism of an imagined stressor could be related to its perceived stress (Lebois, Papies, et al., 2015; Papies, Barsalou, & Custers, 2012; Papies, Pronk, Keesman, & Barsalou, 2015). Specifically, as an imagined stressor becomes increasingly realistic, perceptions of threat and action inefficacy may seem increasingly compelling. Fourth, uncertainty could potentially be associated with

perceived stress. As people become more uncertain about the causes, consequences, or ability to cope with a stressful situation, perceived stress may increase. Relative to the features in Figure 1, we hypothesized that these other kinds of features would be relatively peripheral, playing a more minor role in predicting perceived stress, given that they appear less central to stressful situations.

Finally, we predicted that individual differences in judgments of perceived stress would occur. Because people differ in their experiences with stressors, they should establish different features in their respective categories of stressful situations (or perhaps different emphases on these features). As a consequence, these different categories should produce individual differences in perceived stress. Overall levels of perceived stress might differ across individuals, as might the range of stressfulness they perceive.

Methods

Participants

Because this exploratory study is the first to provide a comprehensive assessment of the features that predict perceived stress, we assessed a non-clinical sample in the laboratory. Furthermore, we focused on the detailed processing of stress in a relatively small sample, an approach similar to detailed psychophysical analysis of a few individuals in a vision experiment. Over 37 to 51 days, each participant provided 20 ratings for each of 572 situations, for a total of 11,440 ratings per participant. As described in the Discussion, once we understand how a non-clinical sample categorizes stress, we can extend our methods and model to clinical populations under a variety of real-world conditions. Thus, our participants were 12 Emory University students (6 females), ranging in age from 23 to 38 ($M = 27.5$), predominately Caucasian (66.7%), with 25% Asian and 8.3% Hispanic. All were native English speakers with normal or corrected vision, and received \$100 compensation.

Design

Each participant performed 20 ratings on Likert scales for each of 572 situations in a repeated-measures design with no grouping variables. Participants received each situation a total of 6 times, once in each of 6 rating groups (see the Procedure section for details). For a

given rating group, each participant received the 572 situations in a different random order.

However, the order of the six rating groups, and also the sequence of ratings within each group, followed a set order to prevent certain ratings from being affected by earlier ratings.

Experience and Familiarity ratings, for example, were completed first to ensure that viewing the situations previously for other ratings did not produce carry-over effects on these memory judgments. Other ratings were grouped and positioned sequentially for similar reasons.

Additionally, the fixed order of ratings within each group made the task easier for participants, allowing them to settle into a response rhythm as they performed the ratings for a group in a constant order across the 572 situations. Table 1 presents the order of the six groups, together with the order of ratings within each.

Materials

We constructed one-sentence descriptions of 572 situations likely to be familiar in the participant population. Of these situations, 286 were stressful and 286 were non-stressful. To enhance the ecological validity of the stressful situations, two sampling strategies were used. First, stressful situations were drawn from Almeida et al.'s (2002) nation-wide sample of stressful life events. Second, student research assistants helped to develop a set of stressful situations relevant to an undergraduate student population. See the Supplementary Materials (SM) for all 572 situations.

All of the stressful situations involved interpersonal tensions occurring in college life (e.g., "Your professor just accused you of cheating on an exam"). For each stressful situation, a matched non-stressful situation was constructed that included similar characters and settings, but that focused on a non-threatening interpersonal interaction (e.g., "Your professor just passed out lecture notes in preparation for the next class"). Each sentence describing a situation contained second person ("you") references to promote participant engagement. Including a broad range of stressful and non-stressful situations provided sufficient variability to establish whether the features in Figure 1 predict perceived stress. The Linguistic Inquiry and Word Count database was used to ensure that stressful and non-stressful situations were comparable on irrelevant variables, such as sentence length and tense (Tausczik & Pennebaker, 2010).

Procedure

As Table 1 indicates, participants performed the six groups of ratings in the following order: (1) experience and familiarity, (2) perceived stress and plausibility of experience, (3) basic conditions for stress and perseveration, (4) imagery and bodily experience, (5) valence and arousal, and (6) certainty. Before beginning each group, the experimenter first read participants detailed instructions about the ratings. During these instructions, participants were shown the ratings and associated rating scales, illustrated with an example situation. Participants then received one practice situation, evaluating it on all the rating scales for the group, and discussing the rating scales with the experimenter, if necessary. See the SM for the specific rating scales used.

Participants received additional instructions relevant to particular ratings. For the experience and familiarity group, participants could indicate that they had experienced a particular situation even if their experience was not identical to the situation described. For the imagery and bodily experience group, participants were told that bodily experience is anything going on in one's body (e.g., sensing your heart beat, your face getting red), whereas verbal imagery is hearing people talking in the situation. For the valence and arousal group, participants were told: (1) valence is the degree of pleasantness or unpleasantness in a situation, (2) arousal is the degree to which one feels awake and reactive during the situation, (3) a distinct difference exists between them (e.g., high arousal can be both pleasant or unpleasant; Wilson-Mendenhall, Barrett, & Barsalou, 2013).

Once participants understood the instructions for a particular rating group, they received the 572 situations in random order and evaluated them on the rating scales for that particular group in a fixed order. On each trial, a sentence describing a situation appeared at the top of the computer screen, with the first rating question and scale directly below it. Participants had as much time as needed to read the sentence and make a rating. Once the participant entered a rating, the next question appeared immediately, while the same situation remained at the top of the screen. This process continued until the participant had made all the ratings in the current group for the situation. At this point, participants had two options: (1) If they felt they had made an error, they could press the SPACE bar, go back, and change their

responses, or (2) if they were ready to perform the same ratings on the next situation, they pressed the ENTER key and moved on. After judging situations for 15-20 min, participants had the option to continue with another 15-20 minute batch of ratings, to take a break, or to stop for the day.

Participants took a total of 10 to 19 sessions to complete the experiment, with the total period ranging from 37 to 51 days. The time spent on a given day ranged from 30 min to 120 min. Participants always completed the final 15-20 min batch of ratings before stopping for the day. This procedure continued for every group of ratings until each participant had completed all 20 ratings for each of the 572 scenarios (11,440 ratings total). Table 1 presents the mean and standard deviation for each of the 20 ratings.

Statistical Method

First we assessed whether the hypothesized perceived stress-related features in Figure 1 could be reduced into a smaller number of latent variables. Treating situations as the unit of analysis, we used exploratory factor analysis to establish the number of distinct dimensions underlying the features in Figure 1. A common factor analysis was run on the matrix of ratings for the 19 relevant indicator variables for all participants, excluding perceived stress (which would later serve as the dependent variable in regression models).³ Unweighted least squares factor extraction indicated that 4 factors underlay the 19 predictors (by visual inspection of a scree plot for the correlation matrix eigenvalues). The four factors were transformed by an oblique (correlated factors) promax rotation with Kaiser normalization to make them more interpretable.⁴ Each variable was assigned to the factor on which it loaded most heavily. We then generated factor scores for the four factors using the standardized regression method, and used these derived variables as predictors of the perceived stress for each situation.

Specifically, we used multilevel regression models (e.g., Snijders & Boskers, 2012) to assess how well the four derived factors predicted variation in perceived stress. These models estimated the proportion of variance that reflected between-situation differences in perceived stress, while also evaluating fixed and random effects associated with the four factors from the factor analysis. In these models, situation was treated as the Level 1 unit of

analysis, and the fixed effects estimated the average influence of each derived factor on perceived stress, aggregated across situations. Participant served as the Level 2 unit of analysis in models that used maximum likelihood estimation in the SPSS Mixed Procedure (version 20; see Heck, Thomas, & Tabata, 2014). The covariance structure for random effects was specified as orthogonal variance components. Significance tests on random effects for regression slopes and intercepts were evaluated by likelihood-ratio χ^2 tests and also by the normal-deviate Wald test (ratio of the variance estimate to its estimated standard error).

We began with two preliminary models not of substantive interest, but necessary for later computing proportion of variance estimates in the critical models. The first model (Model 0) included a fixed intercept (Model 0; RES-I) and estimated the aggregate variance of the residuals (i.e., the variance of the perceived stress ratings). Model 0 was used later to calculate a residual variance for any model attempting to explain variance in perceived stress (i.e., the dependent variable, RES-M), generating a pseudo- R^2 statistic: $(\text{RES-I} - \text{RES-M}) / \text{RES-I}$ (Snijders & Boskers, 2012). A second preliminary model (Model 00) estimated both a fixed intercept together with random intercepts for participants, disaggregating consistent participant variance from situation and situation X participant variance. The variance estimates from Models 0 and 00 were used later to assess how much variance the individual intercepts for participants explained in perceived stress.

Five nested models were used to evaluate predictors of perceived stress, and to generate the likelihood-ratio tests for random effects (with the difference in -2LL fitting functions for the maximum likelihood estimation being asymptotically distributed as a χ^2 variate, with df equal to the number of parameters added to the model). First, Model 1 added the fixed effect of Situations to Model 00, assessing the ability of the 572 situations to predict perceived stress. Using derived covariates for the four factors from the factor analysis, Model 2 estimated the fixed effects of these four covariates on perceived stress (without the fixed effect of Situations or any random effects). This model assumed that each covariate contributed to perceived stress in the same way across participants. Model 3 added the random intercepts for participants back into Model 2, offering a first assessment of whether

individual differences occurred in predicting perceived stress. Model 4 additionally included the random effect of the individual slopes for the most important predictive factor in Model 2, further assessing individual differences. Model 5 added Situations as a fixed effect back into Model 4, assessing the relationship between Situations and the derived factor covariates, while continuing to assess individual differences for intercepts and slopes.

Results

Correlation Analysis

We hypothesized that the features of the situated structure in Figure 1—specifically, expectation violation, self-threat, lack of efficacy, emotion, perseverance, bodily states, and coping certainty—would be related to ratings of perceived stress. As the correlations in Table 1 illustrate, all of these features correlated significantly with perceived stress (see SM Table 1 for the full correlation matrix).

Self-threat, negative valence, and perseverance were most strongly associated with perceived stress and were also highly inter-correlated with each other. As situations appeared more threatening, they became more negative and stressful, and were more likely to be associated with perseverance (Dickerson, Gruenewald, & Kemeny, 2004; Watkins, 2008).

Greater lack of efficacy in managing a situation and greater expectation violation were both associated with greater perceived stress. Consistent with existing literature, when participants believed that they lacked the ability to effectively manage an interaction described in a situation, they reported greater overall stressfulness (e.g., Bandura, 1997; Cooper & Dewe, 2004; Lazarus, 1993). The role of expectation violation in stress may reflect the disruption that results from general upheaval in one's plans, goals, and aspirations for the future (e.g., Brown & Harris, 1989). Additionally, when a situation violated expectations, participants reported less experience with the situation and less belief in their capacity to cope with it effectively (see SM Table 1). In contrast, the more certainty participants experienced, the less stress they perceived. Perhaps greater certainty indicates, more generally, believing that a coping solution can be achieved in the imagined situation.

Higher arousal and bodily experience were associated with more perceived stress. Higher arousal is a well-documented response to

stressful situations, often related to activation of the hypothalamic-pituitary-adrenal axis (e.g., Ganzel, Morris, & Wethington, 2010). Among the imagery and bodily experience predictors in our dataset, bodily experience was much more strongly correlated with perceived stress than were the related imagery variables (i.e., visual, action, verbal). Bodily experience may be especially important because it is frequently associated with stressful experiences, whereas other types of imagery may vary more widely, often not being salient.

Greater experience and familiarity with the situation were both associated with less perceived stress, perhaps because participants had dealt successfully with similar situations previously. Indeed, experience and familiarity were positively correlated with certainty about one's ability to cope with the situation (SM Table 1). Additionally, as situations became more plausible, they also became less stressful, perhaps because plausibility was positively correlated with experience, coping, and efficacy (SM Table 1).

Greater positive valence was related to lower perceived stress. Interestingly, the negative correlation between positive valence and perceived stress was much smaller than the positive correlation between negative valence and perceived stress. This pattern most likely reflects the fact that our stressful situations were written to be unpleasant and stressful, and did not include positive situations that are also stressful (e.g., planning a wedding). Additionally, as much research shows, positive and negative valence are often not perfect inverses of one another, given that a situation can have both positive and negative aspects (e.g., Wilson-Mendenhall et al., 2013). Although we designed our stressful situations to have negative valence, some of them may have inadvertently had positive features as well. Another possibility is that range restriction drove the difference in predictability for positive and negative affect (*SDs* of 1.28 and 2.08, respectively). Still another possibility is that positive emotion is not generally predictive of stress, whereas negative emotion is.

Not all the features assessed were highly, or even moderately, correlated with perceived stress. Vicarious familiarity, being there, visual imagery, and action imagery were either weakly or negatively correlated with perceived stress, and verbal imagery was unrelated. Vicarious

familiarity and perceived stress were related in the expected direction: More vicarious familiarity was associated with less perceived stress. This correlation, however, was very small, implying that personal experience and familiarity are more important than vicarious familiarity. The small negative and non-significant correlations for being there, and also for visual imagery, action imagery, and verbal imagery most likely reflect the brevity of the stimuli. Because each description of a situation only contained as much detail as would fit in a single sentence, these descriptions may not have contained enough detail to generate the imagery necessary for relations between these variables and perceived stress to emerge. Perhaps longer more detailed descriptions, or actual life events, would produce significant relations. A median split on stressfulness ratings indicated that the correlation between being there and the most stressful 50% of scenarios was in the expected positive direction ($r = .22, p < .001$). For these situations, the more participants experienced "being there," the more stressful they found them. This suggests that "being there" may only play a role in experiencing stress when strong affect is present (cf. Lebois, Papies, et al., 2015; Papies et al., 2015).

With the exception of some imagery variables and vicarious familiarity, all of the hypothesized variables—expectation violation, self-threat, action inefficacy, emotion, perseveration, bodily states, and coping certainty—were related to stressful cognition in the expected directions. This pattern is consistent with our account of stress categorization: All of the central features for stressful situations in Figure 1 were associated with perceived stress.

Data Reduction through Factor Analysis

As described in the Methods section, we conducted an exploratory factor analysis on the full matrix of rated features for the purpose of generating a reduced set of variables to predict perceived stress. The four-factor solution explained almost 60% of the variance in the rated features. Table 2 reports the factor loadings and communalities. Some of the communalities were relatively low (e.g., for verbal imagery, positive valence). Our evaluation of the eigenvalues and some higher-dimensional solutions, however, suggested that adding additional factors would not improve the solution, resulting in so-called 'singleton' or feature-specific factors, with only one

feature loading on a factor. Although we could have deleted features with low communalities from the solution, all factors were determined empirically by at least moderate loadings for some features (furthermore, low loadings in factor analysis are not atypical). After considering our choices, we opted to include all features in estimating the factor scores for later regressions, allowing whatever variance was available for each feature to contribute to estimating these scores.

The four factors were well-defined and easily interpreted. Factor 1, labeled Core Stress Features, was most important, accounting for 40% of the item variance. The key features for stressful situations in Figure 1— expectation violation, self-threat, action inefficacy, negative valence, arousal, and perseveration—all loaded on this factor (along with closely related features of bodily experience and positive valence). Factor 2 (Experience) appeared to capture participants' prior and present experience with the situations, including judgments of familiarity, experience, plausibility, vicarious familiarity, and being there, accounting for 11% of the total item variance. Factor 3 (Certainty) was defined by loadings of the three certainty judgments for situation, coping, and outcome, accounting for 5% of the total item variance. Factor 4 (Imagery) was defined by loadings for rated imagery of action, vision, and verbalization, accounting for 3% of the total item variance.⁵

A potential methodological concern was that we had participants rate groups of features together (to minimize carry-over effects across ratings), which could have caused features in these groups to be correlated. The factor analysis indicates that this possible source of method variance was not a significant problem for three reasons. First, features rated in the same group often loaded on different factors. In Group 4, for example, bodily experience primarily loaded on Core Stress Features, whereas the other imagery factors loaded on Imagery. Second, features in different groups sometimes loaded on the same factor. Features from Groups 3, 4, and 5 loaded on Core Stress Features. Features from Groups 1 and 2 loaded on Experience. Features from Groups 2 and 4 loaded on Imagery. Third, the overall loadings that resulted generally followed our predictions. Whereas the core features of stress loaded together, the more peripheral features for experience, certainty, and imagery loaded on separate factors.

Predicting Perceived Stress with Multilevel Regression Models

Our primary goal was to establish the situated features that most strongly predict the perceived stress of situations. If the features of stressful situations in Figure 1 provide a good account of stress categorization, then these situated features should be strong predictors of a situation's perceived stress. Thus, we hypothesized that a situation's value on the Core Stress Features factor should strongly predict its perceived stress, with the other three factors for Experience, Certainty, and Imagery being less important.

Preliminary models. Table 3 first reports results from two preliminary multilevel models that evaluated variation in the stressfulness ratings for the 12 participant X 572 situation matrix. Model 0 was a null-model with a fixed intercept across participants used to estimate overall variance in perceived stress. Model 00 was a random-intercept model used to establish consistent individual differences in mean stressfulness ratings. In this model, the 12 participants differed in the average levels of stressfulness that they perceived in the events (estimated variance = .27, $SE = .11$, Wald $Z = 2.39$, $p = .017$). Notably, however, these stable individual differences only accounted for 6% of the total variance in perceived stress, indicating that individual differences in intercepts did not explain much of its variance.

Modeling the effect of Situations. The first substantive model, Model 1, again included participant intercepts as a random effect but also included Situations as a fixed effect with 572 levels, one for each situation. Although we could have estimated a random variance component for Situations, we opted to estimate fixed effects so that we could examine the specific deviation scores of different situations, rather than absorb all these effects into an aggregate random variance component. As reported in Table 3, Model 1 explained 76% of the variance in the perceived stress ratings. The 572 situations differed considerably (on average) in perceived stress, $F(571, 6,852) = 50.99$, $p < .001$, explaining about 70% of its total variance (the increment from Model 00). Finally, the model residuals accounted for the remaining 18% of the total variance, pooling Situations X Participants interaction variance and random measurement error variance (the Situations X Participants

interaction variance cannot be separated from measurement error and hence is not uniquely estimable).

Table 4 provides a sense of how much the situations varied in perceived stress, presenting situations from the low end, middle, and high end of the perceived stress distribution (together with their regression coefficients and standard errors from Model 1). As will be seen next, the factors for Core Stress Features and Imagery were most important for explaining variance in perceived stress. For this reason, Table 4 also presents the average values for the features that loaded on these two factors, to further provide a sense of how the situations varied.

Multilevel models with covariates. As we just saw, situations constituted an important source of variance in explaining perceived stress. Situations varied substantially in perceived stress, with this variation being highly consistent across participants. This outcome justified evaluating whether covariates on the four derived factors in Table 2 explain how situations vary in perceived stress. If our original predictions are correct, then scores on the Core Stress Features factor should explain much of this variance. As we proceed through the final four models, we will assess this we issue.

In each of the four models to follow, perceived stress ratings made by the 12 participants for the 572 situations were regressed onto covariates for the 4 factors from the factor analysis in Table 2 (Core Stress Features, Experience, Certainty, Imagery). Each covariate was the estimated value of the respective factor for the specific situation for each participant. Because all factor scores were standardized by the factor score estimation method, they were effectively scaled in the same units of measurement. To assess how well the four covariates explained perceived stress, Model 2 only included these covariates, excluding random participant intercepts and Situations. Model 3 added the random effect of participant intercepts into Model 2. Model 4 further added the random effect of participant slopes for the Core Stress Features factor. Model 5 further added the fixed effect of Situations. Table 3 presents the goodness-of-fit statistics for each model.

For Model 2, the factors of Core Stress Features, Certainty, and Imagery significantly predicted perceived stress, whereas Experience did not. As Table 3 shows, Core Stress Features

had a much higher fixed effect on perceived stress than did Certainty and Imagery, consistent with our hypothesis. Because the Certainty and Imagery coefficients were very small, they may not represent reliable relationships with perceived stress (as assessed in subsequent analyses). Overall, the pseudo- R^2 statistic indicated that the four covariates explained 75% of the variance in perceived stress.

In Model 3, all four fixed effects were again included as in Model 2, along with the random effect of participant intercepts for perceived stress. Again, this random effect can be conceptualized as participants varying in their average levels of perceived stress across the 572 situations, with some individuals having higher average levels than others, while controlling for the covariates. This random effect was significant, with a likelihood-ratio of $\chi^2 = 1,906.35$, $df = 1$, $p < .01$.

Including the random effect of participant intercepts in Model 3 altered the pattern of fixed effects observed in Model 1, with Experience now becoming a significant predictor, and Certainty dropping below significance. Consistent with Model 1, Core Stress Features still had the largest regression coefficient, whereas Experience and Imagery played much smaller roles. Adding the random effect of stress intercepts for participants increased the estimated R^2 from 75% to 81%.

Model 4 included all parameters from Model 3, while adding a random effect for participants' slopes on the Core Stress Features factor. This random effect can be conceptualized as allowing participants to vary in the slope that regresses perceived stress onto the Core Stress Features covariate (i.e., for some participants, this regression coefficient could be high, whereas for other participants it could be low). Adding the random effect for slopes improved fit, rejecting the null hypothesis of fixed slopes across individuals, $LR \chi^2 = 36.95$, $df = 2$, $p < .01$. Both Wald tests of random variance components were significant for Model 4, specifically, the random effect of participant intercepts for perceived stress (Estimated Variance = .29, $SE = .12$, Wald $Z = 2.44$, $p = .015$), and the random effect of Core Stress Features slope (Estimated Variance = .13, $SE = .06$, Wald $Z = 2.42$, $p = .015$). Figure 2 plots the individual differences in intercepts and slopes for the Core Stress Features factor from Model 4.

Including random effects for both the intercepts and slopes again changed the pattern of fixed effects that explained perceived stress. In

Model 4, only the Core Stress Features factor explained significant variance, whereas all other fixed effects failed to achieve statistical significance. According to Model 4, the features loading on Core Stress Features (expectation violation, perceived self-threat, action inefficacy, negative valence, positive valence, arousal, bodily experience, and perseveration) account for all the explainable variance in perceived stress ratings (i.e., when all fixed and random factors associated with this factor were included). Adding the second random effect of Core Stress Features slopes significantly increased the explained variance from 81% to 84%.

Similar to Model 1, Model 5 added Situation back into the model as a fixed-effects factor, while including the covariates and random effects in Model 4. Of interest was whether the covariates fully explained the situation variance originally observed in Model 1, or whether the 572 situations explained additional variance in stressfulness not accounted for by the covariates. As Table 3 shows, the effect of Situations in Model 5 was significant ($F(571, 6,840) = 3.73, p < .001$), with Situations explaining additional variance in perceived stress beyond the covariates. We address the implications of this finding in a moment. An additional finding associated with Model 5 is that the Imagery covariate re-emerged as a significant predictor of perceived stress (see Table 3). Once variance associated with Situations was controlled, the perceived stress of a situation was again associated with increased imagery (as in Models 1 and 2). Adding Situations in Model 5 significantly increase the explained variance in perceived stress from 84% to 88%.

As we saw earlier for Model 1, Situations explained a substantial 70% of the variance in perceived stress without the covariates. Including Situations in Model 5 with the covariates, however, only increased the explained variance by 4%, relative to Model 4 when Situations wasn't included. This pattern indicates that the covariates explained most (but not all) of the Situations-related variance in perceived stress. Specifically, the covariates explained about 95% of the variance in perceived stress that Situations originally explained (i.e., 80% / 84%). Furthermore, because participants only explained 6% of the variance in Models 00, 1, and 3, it follows that variance across the situations associated with the

covariates accounted for most of the explained variance in perceived stress. Because the Core Stress Features factor was by far the most important covariate, variance on the core stress features was primarily responsible for situation variance, although variance on the imagery features also played a minor role.

Finally, when controlling on Situation, the covariates uniquely explained 12% of the total variance in perceived stress (the difference in R^2 from Model 1 to Model 5), again illustrating the close relationship between variance associated with the Situations and the covariates. Additionally, the covariates accounted for some of the variance in the Situations X Participants interaction for Model 1, explaining 32% of it (i.e., the proportional reduction in residual variance from Model 1 to Model 5 $(.77-.53)/.77$).

Further analysis of the Core Stress

Features factor. Can the features that load on the Core Stress Features factor be differentiated, with subsets of these features being differentially related to perceived stress? Perhaps only a few of these features are important, with the others being less important or not important at all. To test this hypothesis, a common factor analysis on the eight core features was performed, analogous to the factor analysis described earlier. An arousal factor emerged that differed from a factor for the remaining seven core features (expectation violation, self threat, action inefficacy, bodily experience, negative valence, positive valence, perseveration,) with these two factors being highly correlated ($r = .78$).

Next these two factors were used to predict perceived stress in a multilevel regression model. Importantly, both factors explained significant unique variance, even when random effects for intercepts and slopes were entered as in Model 4. Based on these analyses, we conclude that all features loading on the original Core Stress Features factor are important for explaining perceived stress, and again that they are highly related to one another, approaching a unitary construct. These analyses further confirm our prediction that a core set of features underlies how people conceptualize stressful experiences.

Further analysis of individual differences.

Individuals varied in the overall levels of stress that they perceived (random intercepts) and in how strongly their scores on the Core Stress Features factor predicted perceived stress (random

slopes). In a final analysis, we explored individual differences in the stress intercepts and slopes for the Core Stress Features factor. As the X-axis in Figure 3 illustrates, individuals varied widely in the standard deviations of their perceived stress judgments (from about 1.4 to 2.4). In other words, participants varied in the granularity of these judgments, with some participants drawing finer distinctions than others. As the left panel of Figure 3 illustrates further, this granularity was positively correlated with individual intercepts for stressfulness ($r = .76, p = .005$). As participants' overall average or baseline for perceived stress ratings increased (i.e., higher intercepts), the granularity of their stress judgments became finer. One possible interpretation is that higher levels of perceived stress lead to greater differentiation (and therefore greater variability) in perceiving degrees of stress.

Finally, as the right panel of Figure 3 illustrates, the granularity of perceived stress ratings was also positively correlated with individual slopes for the Core Stress Features factor ($r = .67, p = .017$). As the Core Stress Features factor explained increasing variance in perceived stress (steeper slopes), the granularity of perceived stress ratings again became finer. A possible interpretation is that greater variability in perceived stress ratings enabled greater prediction through greater range. Alternatively, greater use of the Core Stress Features produced greater variability in judgments of perceived stress.

Discussion

The experiment reported here focused on establishing the features that predict perceived stress, in contrast to previous research that has primarily focused on perceived stress as a predictor of health outcomes. To our knowledge, this experiment is the first to establish a comprehensive set of features that predicts perceived stress. Because perceived stress is related to health outcomes (e.g., Monroe, 2008), it is important to understand the factors that predict it, such that it can be better understood, and so that informed interventions can be developed to reduce it.

We developed an account of situated stress categorization that motivated our experiment. From this perspective, we predicted that when a situation possesses features associated with stressful experiences, the situation should be perceived as stressful; conversely, situations

lacking these features should be perceived as non-stressful. Furthermore, if individuals vary in the features associated with their respective stress categories, they should exhibit individual differences in stress perception.

To test these predictions, we assessed the extent to which 19 features predicted perceived stress. As predicted, all the critical features that we hypothesized as central to categorizing situations as stressful in Figure 1 were highly correlated with perceived stress, including expectation violation, self-threat, action inefficacy, negative valence, arousal, and perseveration, along with the closely-related features of positive valence and bodily experience (Table 1). Furthermore, all these features loaded on a Core Stress Features factor that captured a relatively unitary construct of what constitutes a stressful experience (Table 2). Most importantly, the Core Stress Features factor was consistently the most important factor in explaining perceived stress, across a variety of multilevel models (Table 3). Not only did it enter into every critical model, it played by far the largest explanatory role.

Across the critical models, the other three factors for Imagery, Experience, and Certainty also contributed to explaining perceived stress, with Imagery being the most consistent. Although Imagery's contribution was relatively modest compared to Core Stress Features, its presence suggests that the perceived stress increases with how vividly a situation is imagined. Clearly, causality could go in either direction: Increasing imagery could amplify stress, or increasing stress could intensify imagery. A related possibility is that increasing imagery increases the subjective realism of imagined situations, further contributing to their perceived stress (cf. Lebois et al., 2015; Papies et al., 2012, 2015). Regardless, the importance of imagery is consistent with the perspective of grounded cognition, which assumes that modality-specific processing underlies the representation of situations (Barsalou, 2008, 2009, 2016).

Perceived stress also varied systematically with both situations and participants. In an analysis when covariates for the four factors were not included, situations explained 70% of the variance in perceived stress, whereas participants only explained 6%. Thus, variability in situations played a much larger role in perceived stress than did variability in participants. Furthermore, the Core Stress

Features factor explained nearly all the variance associated with situations. Consistent with our original prediction, the situated features in Figure 1 were primarily responsible for how perceived stress varied across situations.

Finally, individual differences consistently contributed to perceived stress. As random effects across the critical models demonstrated, participants differed significantly in their overall levels of perceived stress, and in how well the Core Stress Features factor predicted their perceived stress (Table 3, Figures 2 and 3).

To our knowledge, no previous work has attempted to comprehensively establish the features that predict perceived stress. In the results reported here, the fixed and random effects across the critical models explained 75% to 88% of its variance (Table 3). In the best fitting Model 5, fixed effects for Core Stress Features, Imagery, and Situations, together with random effects for participant intercepts on perceived stress and participant slopes on Core Stress Features, explained 88% of the variance in perceived stress.

These results indicate that the perspective of grounded cognition offers a potentially useful way of understanding the categorization of stress. On the one hand, situational features associated with stressful experiences played the central role in explaining perceived stress. On the other, increasing imagery was associated with increased perceptions of stress as well, although playing a minor role. Perhaps in other contexts, when people immerse themselves more deeply in stressful events for longer durations, imagery may play more important roles in perceived stress.

Additionally, these results indicate that perceived stress doesn't simply reflect the basic appraisal features of self-threat and action inefficacy. If only these basic appraisal features were associated with perceiving stress, they alone should have accounted for the explainable variance in perceived stress. As we saw, however, additional features of stressful situations loaded on the same Core Stress Features factor as threat and action inefficacy, including expectation violation, negative valence, positive valence, arousal, bodily experience, and perseveration. Because these latter features occur frequently during stressful situations, they become typical features of the category and contribute to categorizing situations as stressful.

As Figure 1 suggests, when an individual

perceives a situation as exhibiting basic conditions for stress (an expectation violation, a threat, and action inefficacy), these conditions in turn produce primary stress responses (negative emotion, arousal), followed by secondary stress responses (rumination). Over the course of a stressful experience, all these features are likely to occur, such that they become associated with the category of stressful experiences. As future situations match this feature set, they, too, are categorized as stressful. An important goal for future work is to assess whether the process model that Figure 1 implies is correct. Does processing proceed as Figure 1 suggests? Clearly, the features in Figure 1 are important for categorizing situations as stressful, but the additional processing assumptions remain to be tested.

Finally, it is important to note the similarities and differences between our account of situated stress categorization and appraisal theories (e.g., Moors et al., 2013). First, appraisal theories would be very comfortable with our results. The features here that predicted perceived stress are highly similar to those associated with the appraisal, motivational, somatic, motor, and feeling components of emotional episodes in appraisal theories. In some sense, both approaches have attempted to identify the features of emotional situations, understand the relations between features, and establish relations of these features to various outcomes, such as perceived stress and emotion. As a result, both approaches have converged on similar features, while theorizing about them in different ways. Whereas appraisal theory is primarily interested with how appraisal features activate the motivational, somatic, motor, and feeling components of emotional episodes, situated categorization theory focuses more on the categorization processes that underlie situated action. As a consequence, situated categorization theory views perceived stress as utilizing the same basic processes of categorization in general, rather than being a specialized process only associated with stress and emotion.

As a further consequence, we assume that many situated aspects of stressful experiences can become part of the categorization process, not just appraisal features and the other components of emotion that they influence. Perhaps one example that illustrates this emphasis is the importance of rumination in explaining perceived stress found

here. Because rumination is an important part of many stressful situations, it becomes part of how the category of stressful experiences is represented, and contributes to categorizing future situations as stressful. In appraisal theories, however, rumination tends not to be included because it is relatively peripheral to the appraisal process (although it could in principle result as an activated outcome).

Further Exploring Individual Differences in Stress Categorization

To establish the features that underlie stress categorization, we examined how a small sample of relatively homogenous individuals evaluated the stressfulness of imagined situations in a laboratory setting. Our methods and results can be readily extended, however, to a wide variety of clinical populations in everyday contexts (e.g., using briefer instruments that focus on only a few critical features for a small set of real-life events). Within such studies, various individual difference measures from our methods could be utilized, including an individual's overall level on the Core Stress Features factor, their slope for this factor, and their intercept for perceived stress.

Correlations between these individual difference measures and various personality types could then be assessed to establish how people with different personality types perceive stress. Analogously, individual variability in perceived stress could be examined in individuals who live and work in different environments, who have different developmental histories, who have different cultural backgrounds, who are embedded in different social networks, who have different psychopathologies, and who receive different therapeutic treatments. Finally, perceived stress could be examined in groups having different genetic profiles, exploring relations between relevant genes and core features of stress cognition (e.g., Conway, Slavich & Hammen, 2014).

Although the core features of stress loaded on a single factor in the study reported here, it is important for future work to examine whether these features remain integrated or disassemble as individual differences are examined more closely. In certain individuals or sub-groups of individuals, these core features may pattern differently than observed here, reflecting how different groups and individuals adapt the perception of stress to the life events that they encounter, utilizing the resources available for managing them.

As we also saw earlier, individuals explained a

modest 6% of the total variance in perceived stress, varying significantly in their intercepts on this measure. Because the 12 participants in this study constituted relatively homogenous sample, it is not surprising that variability between them played a relatively minor role in explaining perceived stress. In future studies that sample individuals more broadly, the role of participants could increase substantially.

In contrast, variability in situations played a much larger role in perceived stress. Within individuals, situations varied considerably in perceived stress from stressful to non-stressful situations, with different individuals perceiving this variability similarly. This finding fits well with emerging arguments in the stress literature that, on a daily basis, a given individual experiences considerable variability in stress, ranging from minor daily hassles to major life events (e.g., Almeida, 2005). It may be fruitful to regard this intra-individual variability as a formal and direct outcome of fluctuations in the particular situations that individuals experience over the course of a day. Our results here further suggest that different individuals may often perceive this variability in stressful situations similarly. To the extent that different individuals perceive the situated features of situations similarly, they may perceive stress similarly.

We also saw, however, that individuals varied in their perceptions of stress, suggesting that important differences in stress perception exist as well. Such differences may well become increasingly apparent when more heterogeneous samples of individuals are assessed, together with the specific situations that they find stressful in their daily lives. A related possibility is that the same situated features consistently produce stress responses across individuals, with individuals varying in how they experience these features.

Stress Cognition Originates in General Cognitive Mechanisms

We proposed initially that general cognitive mechanisms associated with categorization play a central role in stress perception. As many stress theorists have suggested, stress is a natural response to difficult life events (e.g., Almeida, 2005; McEwen & Sapolsky, 1995; Monroe & Slavich, 2007). To the extent that stress is a natural response, it is not surprising that general cognitive mechanisms play central roles in

producing it (Sanislow et al., 2012).

As we also proposed, however, perceived stress, as a category, has unique features, analogous to how other categories are associated with unique features (e.g., animals, artifacts, foods, emotions). Our findings here confirm that these features are indeed strongly associated with perceived stress. We suspect, however, that these features are not *individually* unique for perceived stress, but are relevant for many other categories as well. Similar to how the features of emotion occur across many categories (Lebois et al., 2016; Wilson-Mendenhall, et al., 2011), so may the features of stressful experiences occur across many categories. We simply propose that these features tend to be relatively unique *as a set* for stressful experiences (Figure 1), relative to non-stressful experiences.

Finally, we assume that as stress becomes increasingly dysfunctional, mechanisms underlying stress categorization operate in increasingly aberrant manners (Sanislow et al., 2010). In some individuals, for example, undue emphasis on high threat and action inefficacy could increase neuroticism, anxiety, and rumination, thereby increasing the attribution that one is experiencing much stress (cf. Bandura, 1997; Blascovich et al., 2000; Higgins, 1989; Watkins, 2008). Similarly, during the categorization of situations, an individual's stress category may generalize too broadly beyond situations typically perceived as stressful (e.g., the dysfunctional generalization that characterizes Posttraumatic Stress Disorder; e.g., Oyarzún, & Packard, 2012).

In general, the methods we have developed for assessing a person's category of stressful experiences could be extended to studying the effects of extreme stressors on health. By characterizing how individuals process core stress features, researchers and clinicians could differentiate various populations in terms of how they experience major and traumatic life events. This approach could also be used to assess treatment effectiveness and to tailor treatments to individuals as a function of how they conceptualize stress in terms of core stress features.

The Relation Between Stress Categorization and Stress Perception

To this point, we have been relatively vague about how stress categorization produces stress perception. We have simply argued that

categorizing a situation into the category of stressful experiences produces the perception of stress. Here we speculate in more detail about the nature of this process, with this account requiring future investigation.

Stress perception could simply result from assigning a situation to the category of stressful experiences. Once this categorization is made, it follows that the situation is the kind of situation that has been stressful in the past, such that it, too, must be stressful. Once the categorization comes to characterize the situation, it makes the situation appear stressful.

The process of categorical inference could further contribute to stress perception. In general, theories of categorization assume that the purpose of categorization is to produce useful inferences (e.g., Barsalou, 2012; Murphy, 2002). Rather than being an end in itself, categorization provides access to rich inferential knowledge that guides understanding and action. When categorizing something as a hammer, for example, inferences follow about its origins, weight, and use. Similarly, when categorizing something as a single malt whisky, inferences follow about its taste and psychological effects. By categorizing the world around us, we access expert knowledge that guides sophisticated goal-directed action in the environment (e.g., Barsalou, 2009, 2016).

The same general principles apply to stress categorization as well. Once a situation is categorized as stressful, inferences about the situation are likely to follow. From the situated perspective, these inferences could take many forms, including emotion, bodily responses, and action (e.g., Barsalou, Niedenthal, Barbey, & Ruppert, 2003). When encountering a particular person, object, or event that has caused stress in the past, the category of stressful experiences might become active, which in turn, could activate related emotions, bodily responses, and/or actions likely to follow. Seeing a difficult co-worker from the distance at the grocery store, for example, might activate the category of stress experiences, producing negative emotion, arousal, and rumination. Once these inferences occur, they are perceived in experience, thereby contributing to the perception that the current situation is stressful. We further assume that these inferences vary systematically across specific kinds of stressful situations, such that the stress response takes a different form tailored to each one (e.g.,

Barsalou, 2016; Lebois et al., 2016; Wilson-Mendenhall et al., 2011).

In summary, the perception of stress could result both from categorizing a situation as stressful and from inferences that follow from this categorization. As the categorization and inferences are experienced together, the perception of stress results. Again, further work is required to establish these proposed relations between stress categorization and stress perception.

Relations Between Stress Cognition, Neural Activity, and Peripheral Physiology

Another direction for future work is to explore relations between features associated with perceived stress and other dimensions of the stress response. As these features vary, what corresponding dimensions of neural and peripheral physiology covary? Because we found that a set of situational features all loaded on a common Core Stress Features factor, this question can be framed as examining the neural and peripheral activity that covaries with this factor across stressful situations.

Analogously, individual differences in overall Core Stress Features scores, Core Stress Feature slopes, and perceived stress intercepts could also be correlated with neural and peripheral activity. As these individual difference measures vary, how do neural activity and peripheral physiology covary (e.g., Slavich, Way, Eisenberger, & Taylor, 2010)? By examining such issues, it may become possible to develop an increasingly articulated and integrated account of stress cognition, its neural bases, and its bodily manifestations.

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Author Contributions

LAML and LWB developed the study concept and design. LAML played the primary role in implementing, running, and analyzing the experiment in the Barsalou Lab at Emory University. CH played a leading role in developing and implementing the analyses. LWB played central roles in implementing the experiment, analyzing the results, and managing the project. GMS played a leading role in relating the research to the stress literature. All authors

contributed to interpreting the results. LAML, LWB, GMS, and CH drafted the manuscript, and all authors contributed to revising it. This project grew out of a related neuroimaging project developed by LAML, Esther K. Papies, LWB, and LFB. LWB and LFB are joint senior authors. All authors approved the final version for submission.

Footnotes

- ¹ An expectation violation (discrepancy) can potentially take numerous forms, including: (1) an unexpected or "surprise" event (e.g., a pop quiz in a course), (2) an unexpected outcome on an expected event (e.g., unexpectedly receiving a poor grade on an expected quiz), (3) an expected violation of a desirable outcome that one would prefer to not see violated (e.g., receiving a poor grade as expected on an exam that violates the aspiration to receive good grades), and (4) the violation of a social norm (e.g., a friend wearing pajamas and a bathrobe in class).
- ² We include bodily experience as a form of imagery because previous memories of a stressful situation could be associated with imagery of bodily states experienced at the time. When, however, this situation is later imagined, the associated bodily imagery is experienced as the *current* bodily state. For this reason, we refer to it here as "bodily experience" instead of as "bodily imagery."
- ³ We opted not to run more complex exploratory multilevel factor models that treated each participant's covariance matrix of ratings separately, generating a solution for each individual. Such an approach would have avoided potential aggregation bias but at the expense of a far more complicated sets of results, further creating difficult issues related to generating scores on rating dimensions across participants. Because our principal research questions were not about between-person heterogeneity in factor structure, we chose to assume invariance of factor structures across participants so as to focus on the question of how equivalently-defined dimensions of situation features predicted perceived stress.
- ⁴ We allowed for oblique factors because it seemed possible that some of the dimensions would be correlated, and we wished to evaluate this

empirically. Forcing orthogonal factors on data actually generated by correlated factors would have absorbed factor correlations into the columns of the factor pattern matrix, which could have resulted in uninterpretable intermediate loadings.

- ⁵ Two additional factor analyses were performed on the stressful events alone and on the non-stressful events alone. The same four factors emerged first in each analysis, explaining 55% and 49% of the explainable variance, respectively, with the ordering of the four factors differing slightly in the two solutions (stressful events: core stress features, experience, certainty, imagery; non-stressful events: experience, certainty, imagery, core stress features). Thus, the factor solutions that held across stressful and non-stressful events together generally occurred within stressful events and non-stressful events alone.

Table 1. Mean responses for rating questions (standard deviations), and correlations with perceived stress.

Question	M (SD)	Pearson r
Group 1. Experience		
Experience (Exper)	.12 (0.95)	-.49*
Familiarity (Fam)	3.19 (2.20)	-.43*
Vicarious Familiarity (VicFam)	3.83 (1.91)	-.09*
Group 2. Perceived Stress and Plausibility of Experience		
Perceived Stress (PrcStr)	3.07 (2.07)	---
Being There (BeTh)	4.66 (1.35)	-.06*
Plausibility (Plaus)	3.85 (2.01)	-.46*
Group 3. Basic Conditions for Stress and Perseveration		
Expectation Violation (ExpVio)	2.56 (1.99)	.67*
Self Threat (SlfThr)	2.76 (2.05)	.78*
Efficacy (Effic)	5.91 (1.50)	-.72*
Perseveration (Persev)	2.94 (2.24)	.82*
Group 4. Imagery and Bodily Experience		
Visual Imagery (VisIm)	4.22 (1.58)	-.15*
Bodily Experience (BodExp)	3.24 (1.96)	.62*
Action Imagery (ActIm)	3.73 (1.76)	-.05*
Verbal Imagery (VrbIm)	3.93 (1.82)	.01
Group 5. Valence and Arousal		
Positive Valence (PosVal)	1.89 (1.28)	-.46*
Negative Valence (NegVal)	3.20 (2.08)	.85*
Arousal (Arous)	3.98 (1.65)	.63*
Group 6. Certainty		
Situation Certainty (SitCer)	5.44 (1.70)	-.46*
Coping Certainty (CopCer)	5.33 (1.71)	-.65*
Outcome Certainty (OutCer)	4.96 (2.00)	-.65*

Note. For the complete rating questions and rating scales, please see the Supplementary Materials.

Table 2. Factor loadings and communalities

Rating	Factors				Communality
	Core Stress	Experience	Certainty	Imagery	
Self Threat	.97				.83
Perseveration	.96				.88
Negative Valence	.85				.83
Efficacy	-.81				.67
Bodily Experience	.76			.27	.61
Expectation Violation	.71				.66
Positive Valence	-.58				.27
Arousal	.53				.44
Familiarity		.99			.93
Experience	-.20	.76			.69
Plausibility	-.27	.57			.59
Vicarious Familiarity	.22	.52			.30
Being There		.43		.31	.33
Coping Certainty			.81		.83
Outcome Certainty			.77		.82
Situation Certainty			.69		.55
Action Imagery				.79	.58
Visual Imagery				.51	.30
Verbal Imagery				.37	.15

Note. Values are the pattern matrix coefficients, representing the variance in a measured variable explained by a factor's *unique* contributions. Values <.2 are suppressed. Communality is the variance in a given variable explained by all the factors (reliability). These are the extraction communalities, not the initial values.

Table 3. Percent of variance in perceived stress explained with multilevel modeling including fixed and random effects estimates.

Model	Coeff	SE	% Variance Explained	Measures of Model Fit	
				-2LL	Residual Variance
Model 0. Fixed Intercept Only			---	29493.58	4.30
Intercept	3.07*	(.15)			
Model 00. Fixed Intercept & Random Intercepts			6.3	29091.11	4.03
Intercept	3.07*	(.15)			
Model 1. Fixed Intercept, Random Intercepts, & Situations			76.0	17729.70	.77
Intercept	1.42*	(.30)			
Situations	.86*				
Model 2. Fixed Intercept & Covariates			75.1	19936.98	1.07
Intercept	3.07*	(.01)			
F1 Core Stress Features	1.76*	(.02)			
F2 Experience	-.01	(.02)			
F3 Certainty	-.10*	(.02)			
F4 Imagery	-.09*	(.02)			
Model 3. Fixed Intercept, Covariates, & Random Intercepts			81.4	18030.63	.80
Intercept	3.07*	(.15)			
F1 Core Stress Features	1.82*	(.02)			
F2 Experience	-.05*	(.01)			
F3 Certainty	-.00	(.02)			
F4 Imagery	.04*	(.02)			
Model 4. Fixed Intercept, Covariates Random Intercepts, & Random F1 Slopes			84.0	17093.68	.69
Intercept	3.09*	(.15)			
F1 Core Stress Features	1.86*	(.11)			
F2 Experience	-.01	(.01)			
F3 Certainty	-.01	(.02)			
F4 Imagery	.03	(.02)			

Model 5.	Fixed Intercept, Covariates,	88.0	15238.83	.53
	Random Intercepts, Random F1 Slopes,			
	& Situations			
Intercept	2.43* (.26)			
F1 Core Stress Features	1.16* (.10)			
F2 Experience	.03 (.01)			
F3 Certainty	-.04 (.02)			
F4 Imagery	.08* (.02)			
Situations	.88*			

Note. * $p < .05$. "Covariates" refers to the four factors from Table 2. F1 is Factor 1, etc. Coeff is coefficient. SE is standard error. 88* Indicates that the situations factor was significant, and that, due to space, the 571 freely estimated values for the 572 situations are not reported. Please see Table 4 for a sampling of these values and for additional information.

Table 4. Expansion of Model 1 from Table 3 showing the situations that had the five lowest, most average, and highest values of perceived stress. For each situation, the regression coefficient and standard error of the coefficient are shown, together with its average value for perceived stress and its average values for the features loading on the Core Stress Features factor (self-threat, perseveration, negative valence, efficacy, bodily experience, expectation violation, positive valence, arousal) and on the Imagery factor (action imagery, visual imagery, verbal imagery).

Scenario	Coeff	SE	PrcStr	Core Stress Features								Imagery		
				SlfThr	Persev	NegVal	Effic	BodExp	ExpVio	PosVal	Arous	ActIm	VisIm	VrbIm
Lowest values of perceived stress														
You watch a mother and child walk past you as you wait for the bus.	-0.42	.36	1.00	1.00	1.50	1.17	7.00	1.92	1.00	2.33	2.67	2.08	6.00	2.33
Your mother buys you a magazine for the trip, and you pack it in your bag.	-0.42	.36	1.00	1.00	1.00	1.25	6.92	1.42	1.08	3.50	3.00	5.25	5.25	2.50
Your friend asks a mutual friend if they can borrow their pen for a second.	-0.42	.36	1.00	1.50	1.00	1.50	7.00	1.25	1.00	1.50	2.08	2.25	4.08	4.00
You catch another driver's eye as you turn left at a green light on the way home.	-0.42	.36	1.00	1.50	1.00	1.17	7.00	2.25	1.00	2.25	2.67	6.08	6.17	2.58
Your roommate gives you the cleaning supplies they bought to put under the sink in the kitchen.	-0.42	.36	1.00	1.50	1.00	1.25	7.00	2.00	1.08	2.00	2.50	5.17	5.25	3.25
Most average values of perceived stress														
You're in the infirmary, and the nurse insists on lights out even though you have to continue working.	1.75	.36	3.17	3.67	3.42	4.25	5.83	3.92	4.00	1.25	4.50	4.50	4.83	5.00
The electric bill is due today, but your roommate doesn't receive their paycheck until next week.	1.75	.36	3.17	3.00	3.50	3.58	6.25	3.33	2.42	1.17	4.00	3.42	3.00	3.33
Your roommate borrowed some of your	1.75	.36	3.17	2.33	3.08	3.75	6.08	3.75	3.83	1.25	3.33	4.08	5.17	4.08

You overhear your significant other laughing with their friend about what a poor driver they think you are.	1.83	.36	3.25	4.58	4.00	4.33	5.00	3.92	4.17	1.33	4.58	3.33	4.08	5.42
Your friends insist on going to the one movie you don't want to spend \$12 on.	1.92	.36	3.33	2.67	2.58	3.58	5.50	3.08	3.33	1.67	3.67	3.50	3.75	4.17
Highest values of perceived stress														
A stranger bursts out of your apartment, and you realize you've been robbed.	5.08	.36	6.50	6.76	6.58	6.33	3.25	6.00	6.33	1.00	6.83	4.92	5.50	3.67
Your dad tells you that he has just been diagnosed with cancer.	5.08	.36	6.50	5.58	7.00	6.83	3.83	6.00	1.83	1.00	6.33	2.83	4.17	5.08
You have to tell your best friend that both their parents passed away in a car accident.	5.17	.36	6.58	5.08	6.75	6.58	3.67	5.67	2.42	1.00	5.75	3.67	3.25	4.42
Your significant other says they're breaking up with you because you hardly make time for them.	5.17	.36	6.58	5.75	6.33	6.42	3.83	5.58	3.92	1.08	5.75	3.58	3.83	5.33
You swerve to avoid a pedestrian and get in a head-on car crash.	5.25	.36	6.67	6.67	6.33	6.50	3.67	6.25	3.67	1.08	6.75	5.17	5.67	3.17

Note. The coefficients are relative to the arbitrary fixed-zero intercept coefficient. Coeff, regression coefficient for the situation from Model 000; SE, standard error of the regression coefficient; PrcStr, perceived stress; SlfThr, self-threat; Persev, perseveration; NegVal, negative valence; Effic, efficacy; BodExp, bodily experience; ExpVio, expectation violation; PosVal, positive valence; Arous, arousal; ActIm, action imagery; VisIm, visual imagery; VrbIm, verbal imagery.

Figure 1. Features predicted to be associated with stressful situations, shown with the global structure that integrates them.

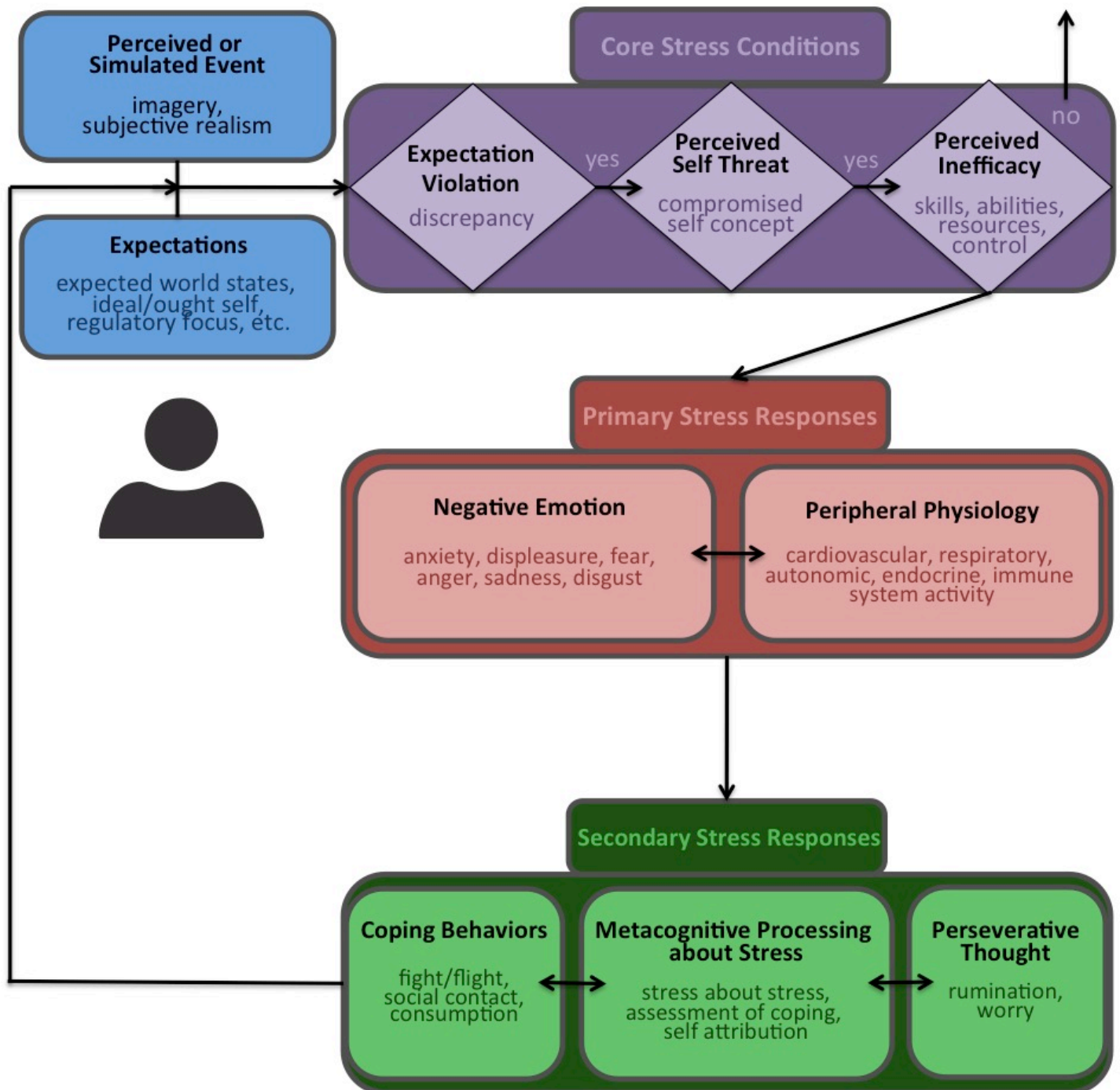


Figure 2. In the estimated regression functions for individuals from Model 4, individual intercepts for perceived stress judgments (at $X=0$), and individual slopes for these judgments as a function of values on the F1 Core Stress Features factor (across the F1 values of the 572 events).

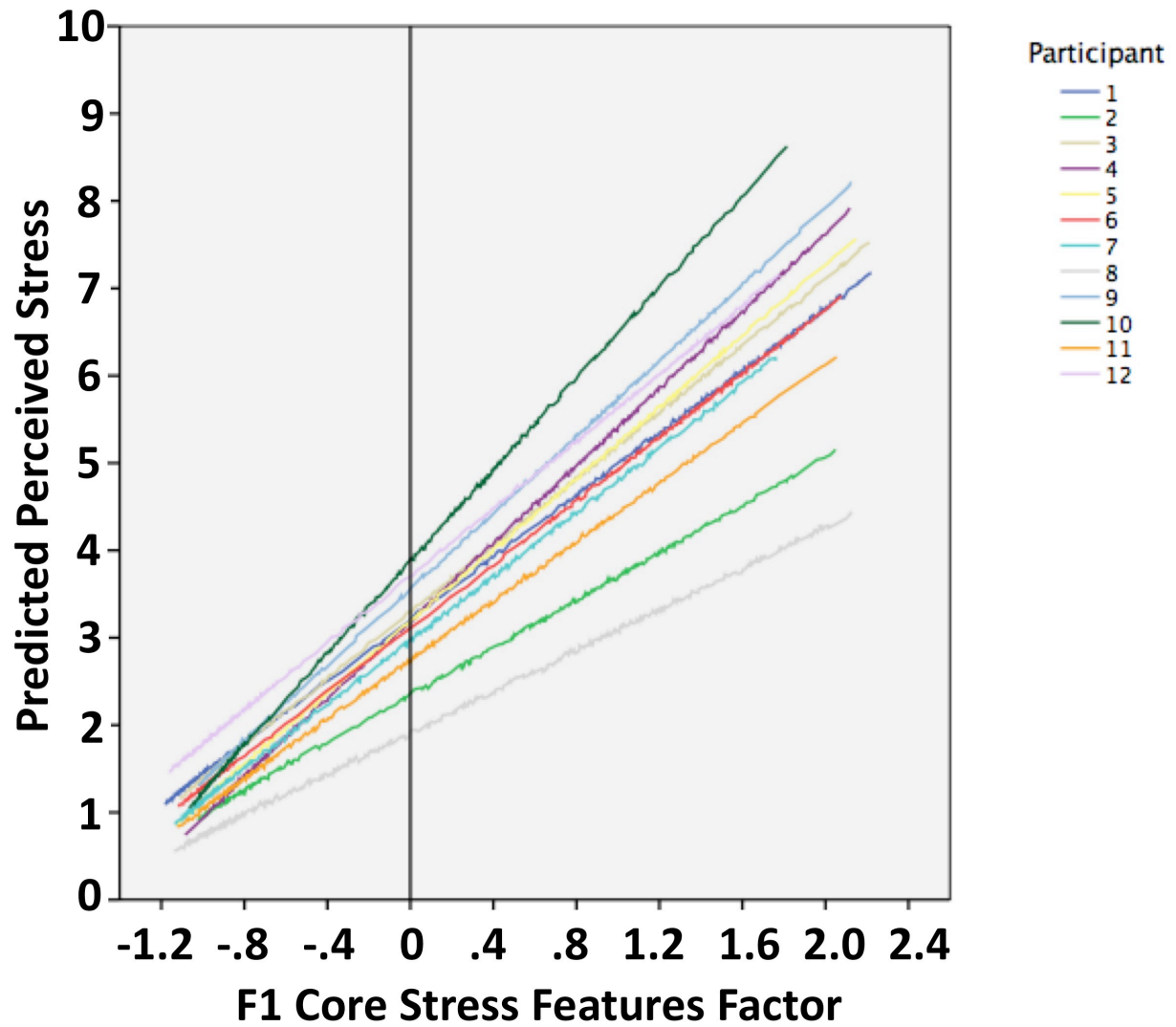
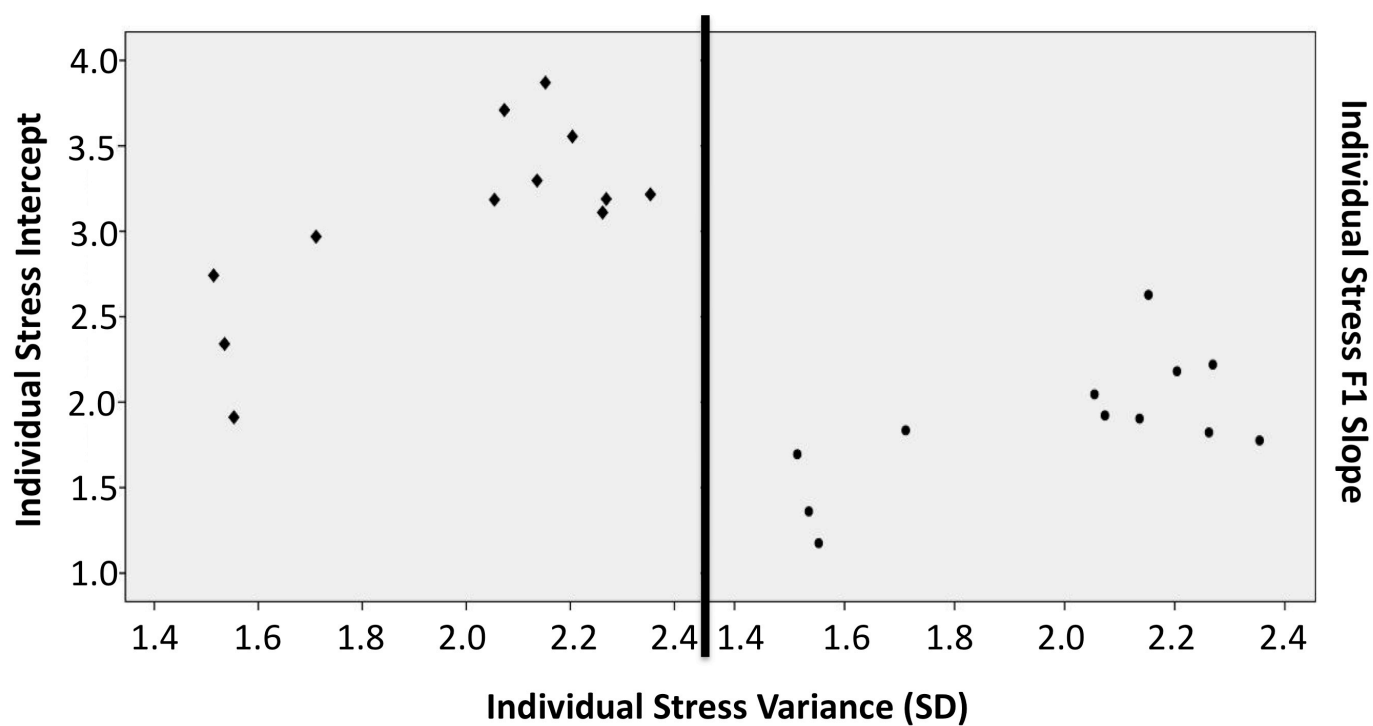


Figure 3. Scatter plots of individual variance (*SD*) in perceived stress, first, with individual intercepts for perceived stress, and second, with individual slopes for perceived stress as a function of the Core Stress Features factor (F1). The scale on the Y axis is the same for both panels.



Establishing the Situated Features Associated with Perceived Stress

Lebois, Hertzog, Slavich, Barrett, and Barsalou

Supplementary Materials (SM)

Materials: Stressful Events

1. You watch a mother slap her child for speaking out in public.
2. Your sibling borrowed your bike, forgot to lock it up, and now it's been stolen.
3. You're working to help pay for school, but your boss fires you because they need someone with more availability.
4. You're late to your summer job a second time, and your boss threatens to fire you.
5. You're late to class and your professor will not open the locked door to let you in.
6. Your boss is away, and decides you must fire a coworker that you get along with well.
7. Your internship boss just scolded you in front of the office for inappropriate work attire.
8. Your internship boss fires you for being late to work too many times.
9. You return home to find your parents converted your bedroom into a guest room without telling you.
10. Your father is in the hospital, but your sibling decides to go on vacation anyway.
11. Your mother refuses to speak to your sibling after the incident.
12. Your parents come to your dorm room and find your roommate left it in complete disarray.
13. You told your parents about the conflict with your best friend's party, but they host the family reunion anyway.
14. Your mother breaks down because you have not been calling them while you are away.
15. Your roommate's significant other sleeps over every night in your tiny one-room dorm room.
16. Your friend asked out a long time crush of yours, even though they knew you were interested.
17. Your significant other announces they've made plans to go to dinner with an ex.
18. The conversation quiets awkwardly as you approach a group of friends.
19. You abhor your friend's significant other, and they just told you they're joining the road trip.
20. You have to tell your parents you failed a class and need to take summer school.
21. You struggle to tell your professor why you cannot attend class anymore.
22. You're the first to be notified of your father's death, and you must now tell relatives.
23. You have to tell your best friend that both their parents passed away in a car accident.
24. Your mother yells at you for not helping more while you're at home over break.
25. Your roommate has left you to clean the toilet again after your most recent party.
26. Your roommate leaves rotting food on the counter, even after many heated requests to clean up.
27. Your mom tells you the basement flooded, and you realize you left your laptop down there.
28. Your roommate accuses you of not cleaning up after yourself in front of your significant other.
29. Your TA accuses you of not trying hard enough even though you put 12hrs into the assignment.
30. Your professor says they did not receive your assignment and gives you a zero.
31. After merely skimming your report, your boss says it's incorrect, and it must be completely redone tonight.
32. You meet with your professor to discuss finishing touches on a project, and they say to start over.
33. Your professor requests a meeting, and they say your work is not at the level it should be.
34. You stay late to finish a project, and you see on facebook your group member went to a party.
35. Your significant other says they're breaking up with you because you hardly make time for them.

36. You're working to help pay for school, but you never have time to finish group assignments.
37. During your group presentation your partner claims they came up with the entire creative idea themselves.
38. You have work to finish before this evening's deadline, but your group member leaves early for a party.
39. During the final exam you realize there is an entire section on a topic your professor didn't cover.
40. Your professor yells at you for not bringing materials they forgot to tell you to bring.
41. You are graded largely on teamwork, but your group member has stopped answering emails.
42. You find out your best friend lied to get out of going to your party.
43. You rush to a 7am group meeting, but realize your friend didn't say it was cancelled.
44. Your professor fails you on an assignment even though the instructions were not clear.
45. Your friend leaves you to pay for an expensive lunch for the second time in a row.
46. Your roommate sold the old fridge on Craig's list without including you in the profits.
47. A stranger bursts out of your apartment, and you realize you've been robbed.
48. While giving a stranger directions, you put down your bag, and when you turn around it's gone.
49. Your parents won't give you more money, and you don't have enough money in your account.
50. You arrive at school to see your roommate has taken the majority of the space for themselves.
51. Your roommate ate all the goodies from your care package while you were away over the weekend.
52. You arrive back from class to see your roommate making fun of some of your work.
53. You overhear a classmate whisper to another that you smell bad.
54. You just tidied your room when your roommate comes back and tracks mud everywhere.
55. Your friend tells you outright they did not like the dinner you cooked for them.
56. Your roommate let a friend sleep in your bed while you were away, and they vomited on the sheets.
57. Your sibling borrowed your car and got in an accident.
58. Your friend borrowed your bike to get to class, but forgot to bring it back.
59. Your roommate takes your car without asking for the 10th time.
60. You come out of the shower to find your roommate and their friend ate all of your pizza.
61. Your friend borrows your expensive textbook and loses it.
62. A friend jokingly grabs you as you bike past causing you to fall violently in front of a crowd.
63. You're on a rollercoaster when the controller announces you'll have to wait as they complete routine maintenance.
64. Your friends insist on going to the one movie you don't want to spend \$12 on.
65. Your professor accuses you of being disrespectful in front of the whole class.
66. Your professor demands you leave class after people were whispering next to you.
67. Your group partner haughtily dismisses your idea for the next class project.
68. Your significant other decides it's time for you both to leave the party without consulting you.
69. Your best friend implies your opinion on the topic is immature and less important.
70. Your significant other makes a condescending remark to you while you are at a friend's party.
71. Your teacher accuses you of being disrespectful for talking during class.
72. Your close friend just told you she's decided to have an abortion.
73. The doctor tells you that you won't feel better for a couple of months.
74. Your parents tell you they won't pay for you to go to your top choice school.
75. Your parents tell you they won't continue to pay for you to go to school given the major you've chosen.
76. Your friend gloats obnoxiously over their midterm grade when they know you didn't do as well.
77. As punishment for rampant cheating, your professor assigns the class 15 page papers due next week.

78. You and your class partner argue over how to format a presentation that's due this afternoon.
79. You go to give your significant other a kiss and they pull away from you.
80. Your significant other accuses you of cheating on them.
81. You notice your significant other missed a call from their ex.
82. You notice your significant other's eyes trail an attractive individual across the room.
83. Instead of coming up to your room after dinner your significant other says they want to go.
84. Your friend confesses that they slept with your significant other.
85. You found clothing that does not belong to you or your significant other scrunched between their bed sheets.
86. You rush to practice after an impromptu late night of partying, and your coach announces there will be drug tests.
87. The university searches your dorm and finds your roommate's pot, but they lie about it being yours.
88. You're hosting a party, and a huge crowd of obnoxious people you don't know shows up.
89. The cops bust your party, and they arrest you for providing alcohol to minors.
90. You're at a party with pot smoking, and one controlled substance offense could prevent you from getting your teaching certification.
91. A friend attends a shady party against your advice, and they overdose on a drug used to spike the drinks.
92. It's the night before your final, and your friends are pressuring you to go out drinking.
93. Your friend accuses you of having a drinking problem in front of your family while you're treating them to dinner.
94. Your significant other decides they have to head home after only 30min with you.
95. Your parent is late to your graduation and misses you walking across the stage.
96. Your friend promised they would visit, but they cancel last minute after you rearranged your schedule to accommodate them.
97. Your roommate hits their snooze button 5 times each morning even though they know you don't have to be up.
98. Your roommate slept in even though they agreed to give you a ride to class.
99. Your professor's lecture ran over and made you late for your exam in the next class.
100. You're rushing to class after lunch, and the waiter stops to flirt before bringing back your credit card.
101. You are late to class, and your teacher yells at you in front of the entire lecture hall.
102. You are running late for a meeting, and the bus driver stops to take his break en route.
103. You arrive late and your professor interrupts the guest speaker to call you out.
104. Your drunk friend insists on driving when they've had more to drink than you.
105. Your roommate decides to watch TV instead of picking you up, and you have to take public transport at midnight.
106. Instead of catching a cab from the party, your friend calls you at 4am the night before your exam.
107. You overhear your significant other laughing with their friend about what a poor driver they think you are.
108. Your friend grabs the next taxi even though they know you're running late.
109. You wait for your friend even though it makes you late, but they took the early shuttle without telling you.
110. You swerve to avoid a pedestrian and get in a head-on car crash.
111. You're rushing to the airport, but your taxi driver takes a wrong turn and now you're stuck in traffic.
112. Your friend stridently criticizes the way you are driving on your way to school.
113. Your roommate lied about handing in your essay while you were sick, and you got a zero.
114. Your significant other makes a snide remark about your family's religious practices.
115. Your good friend is interviewing for the same position as you behind your back.
116. You find out your classmate is suing you for stealing their project idea even though you didn't.
117. You're TAing a class, and a student threatens to sue you for discrimination.
118. You're leaving for your best friend's wedding when your parents say you received a subpoena for court weeks ago.
119. You see someone getting mugged and are forced to go to court as a witness.

120. You get jury duty during exam week, and the judge says your civic duty comes before school.
121. You're assigned jury duty during midterms, but your professor hasn't answered your email request to reschedule exams.
122. You're taking a shortcut home from the library when a cop stops you for trespassing.
123. You're having friends over, things get rowdy, and a cop knocks on your door with a noise violation citation.
124. You hear sirens, and you realize you are being pulled over by a man in an unmarked car.
125. A police officer pulls you over for speeding and gives you a hefty ticket.
126. Your friend was late, you had to park illegally to be on time, and now you have a \$100 fine.
127. A cop pulls you over for going 20mph over the speed limit in a school zone.
128. You rush out to your car, and see a policeman directing the tow truck to take your car away.
129. The driver behind you is tailgating, and they rear-end you at a stoplight.
130. You're waiting outside before class when someone rushes past you, grabbing your bag out of your hands.
131. You glance someone following you as you walk home from the library after a late-night study session.
132. You are at a crowded concert with a friend and someone steals your wallet.
133. You're tutoring an underclassman when they accuse you of being racist.
134. You didn't make it into your top choice school, but your friend, whom you often help with homework, did.
135. You didn't get a scholarship to your top choice college, and your parents can't afford to send you.
136. The last class you need to fulfill your requirements is full, and the professor refuses to let more people in.
137. You're processing the rejection letter from your top choice school when your friend calls to tell you they got accepted.
138. A professor writes you a curt email saying you do not qualify for their advanced course.
139. You've been called to the honor council because a classmate copied off you during an exam.
140. You find out after the fact that your professor had in-class exercises count for nearly half your grade.
141. You have 5 cumulative finals in three days because your professor changed your exam time to accommodate their vacation.
142. You're travelling during registration, and your friend forgets to sign you up for classes like they promised.
143. Because your group member is so inflexible you are unable to complete a project.
144. You're late and discover the professor gave a pop quiz you now only have a minute to finish.
145. Your professor tells you that because you were absent from class you're failing.
146. A construction worker aggressively yells at you for biking past the site.
147. You accidentally sleep through a test and your professor won't let you make it up.
148. Your friend refuses to help you pay for groceries after your card is declined at the checkout.
149. Looking at your bank statement, you see the cashier charged your card three times for one expensive purchase.
150. It's the end of the month, and you don't have enough money to treat your best friend to birthday dinner.
151. The electric bill is due today, but your roommate doesn't receive their paycheck until next week.
152. A waiter at a restaurant tells you that your card was declined.
153. You didn't make enough money this summer, and now your parents say you have to take out a school loan.
154. Your parents call to tell you they're selling the house you grew up in.
155. You've begged your mom to stop smoking, but now she has lung cancer.
156. The day after an argument with your best friend, you get a call that they've attempted suicide.
157. Your friend borrows your moped without asking and gets hit by a car.
158. You're arguing about an exam question, when your professor clutches their chest and falls.
159. A good high school friend confides in you that they have been contemplating suicide.
160. You always complain about dad's daily bacon and eggs, and you receive word he's had a heart attack.
161. Your dad tells you that he has just been diagnosed with cancer.

162. You're sick the night before a big exam; your roommate offers cold medicine that makes it hard to concentrate.
163. You take some medicine, and you sleep through your test because your roommate didn't wake you.
164. You begin to have major side effects from your new medication, though your doctor never mentioned these risks.
165. Your friend blocks your view, and you almost hit another car as you're switching lanes.
166. Your doctor prescribes medicine that makes you extremely nauseous.
167. Your roommate drinks from your water bottle, and then you get sick during exam week.
168. You're in the infirmary, and the nurse insists on lights out even though you have to continue working.
169. Your doctor tells you that you must have immediate surgery.
170. Due to a complication while taking out your wisdom teeth, your dentist decides to put you under.
171. You fall while running and the doctor tells you that you need 50 stitches.
172. Your roommates had a party while you were gone, and now your landlord is threatening to evict you.
173. There's severe water damage in the dorm, and everyone has to move out during midterms.
174. Maintenance crews need to do emergency work on your dorm, and your rector says to remove everything immediately.
175. Your landlord tells you they need next month's rent immediately, and you do not have the money.
176. You're rushing out, but your car won't start because your roommate didn't put any gas in it.
177. Your friend is driving you to class, and they run out of gas in the middle of a busy highway.
178. Your roommate breaks the stove right before you're getting ready to prepare a special meal.
179. You bought an expensive gift for your friend, but they act indifferent.
180. Your significant other is late, and you burn the dinner you spent hours preparing for them.
181. You have to drive two hours back to the store because the store manager gave you the wrong package.
182. While preparing a special meal with the help of a friend, they use the wrong ingredient and ruin it.
183. Your apartment management tries to cover up 7 break-ins over the holidays.
184. Your neighbor agreed to watch your apartment while you were away, but you return home to find broken windows.
185. Your neighbor was burglarized last night, and you realize you forgot to lock your front door.
186. It's 2am and you still have to finish your essay and read for class tomorrow.
187. Your parents visit and your roommate left the room filthy even though they agreed to clean up.
188. You are forced to handle paying the bills this month because your roommate refuses to contribute.
189. You babysit your friend's dog, but when they get back they say you did a lousy job.
190. You're walking with your dog when a car speeds by almost hitting your pet.
191. Your friend watched your cat, and you can tell the cat hasn't been fed for days.
192. Your sibling takes care of your pet fish, but when you return home it's died of starvation.
193. Your sibling begged to take care of the dog, but let it run away.
194. The vet tells you that your dog is very sick and will not last long.
195. The referee makes a lousy call in the last 2 min of the game, and you lose the intramural championships.
196. You're fouled by another player, but the referee calls the foul on you.
197. You're about to relax for the first time in months when your group member demands you finish their section.
198. You made a large bet with a classmate that your favorite team would win, and your team just lost.
199. You and a competitive friend are rooting for opposing teams, and your team loses badly.
200. Your mom wants you to come home for the anniversary of your sibling's death, but you have an exam.
201. Your significant other comes over all dressed up, and you realize you forgot about your anniversary.
202. It is the anniversary of your grandparent's tragic death, and your mom insists everyone visit the cemetery.
203. Your close friend asks you to lie on their behalf to your favorite teacher.

204. Your friend convinces you to lie about being sick to miss class, and you find out there was a pop-quiz.
205. You find out your significant other lied to you about when they broke up with their ex.
206. Your professor just accused you of cheating on an exam.
207. Your friend insists they know the way to the party, but you get lost and miss it.
208. The office misplaced your financial aid paperwork and now your loans won't go through.
209. Your friend gives you vague directions to the party and you circle for an hour trying to find it.
210. Your friend distracted you, you missed your exit ramp in big city traffic, and now you're lost.
211. Your friend gives you incorrect directions, and you get lost in a bad part of town at night.
212. Your uncle balks loudly at the family party when you tell him your political affiliation
213. A news anchor discloses 20 people have died in a meth lab explosion in your hometown.
214. Your parents call to tell you there was a terrorist attack on the news.
215. Your roommate has started smoking regularly inside your room, and they refuse to go outside.
216. Your roommate borrowed some of your favorite clothes, wore them to a smoky party and now they reek.
217. The table next to you continues to smoke in the non-smoking section even after the waiter asks them to stop.
218. A student lights up right next to you, and haughtily blows cigarette smoke in your face.
219. You watch a man smoking next to someone's baby.
220. Your professor decides to add an oral exam to count for half of your final grade.
221. You're giving a final presentation when a late classmate interrupts, and you can't remember what comes next
222. You're giving a group presentation, but the other member doesn't show.
223. The student presenting first runs over their time, leaving only a few minutes to squeeze in your presentation.
224. You have to give a speech in front of your entire college at graduation.
225. You have to give a speech at your high school reunion in front of the entire class.
226. It's your significant other's turn to come over, but they refuse for the fourth time in a row.
227. You wait at the airport for 5 hrs because your roommate forgot to pick you up.
228. Because your sibling was late, you now have to rush home in the middle of a torrential downpour.
229. You and your friend are going on a road trip and get caught in a blizzard.
230. You forget to cover for a coworker who's late again, and your boss fires them.
231. You fail to cover for a group member who hasn't finished yet, and your professor fails them.
232. Because of an incident between you and a coworker at your internship, the coworker is fired.
233. Your offhand remark about the rude behavior of a coworker leads to them getting fired.
234. You let slip to your internship boss that your coworker is always late, and they get fired.
235. Before your parents drop you off at college they tell you they're getting a divorce.
236. You've told your sister to lose her lousy boyfriend a thousand times, and she tells you he's hit her.
237. Your sister refuses to tell you why her arm is all bruised.
238. You overhear your sibling screaming at their significant other in the room next door.
239. Your parents start to treat each other disrespectfully after your youngest sibling leaves for college.
240. You're very close to your sibling, and they've decided to move across the country.
241. Your significant other calls you and says they need to talk with a sobering tone.
242. Your ex calls your current significant other to tell them how selfish and inconsiderate you are.
243. Your significant other accuses you of ignoring them, and tells you they're leaving you for your roommate.
244. A casual friend offers their condolences about a recent breakup you thought no one knew about.
245. You need to break up with your partner, but you know they will take it very badly.

246. Your friends convince you to go on a blind date, but the date never shows up.
247. Your housemate tells you their significant other is moving into your already crowded tiny apartment.
248. You smile at an attractive person, and they roll their eyes.
249. You're about to go on a blind date with someone you will dislike.
250. Your significant other decides to transfer to a school on the opposite coast without discussion.
251. Your significant other has purposefully scheduled time away, and your resentment boils to the surface.
252. A stranger at a party accuses you of ogling their dance partner.
253. Your significant other threatens you physically.
254. You accidentally bump into someone at a bar, and they throw their drink in your face.
255. Your boss doesn't rehire you for the fall semester, and now you cannot afford to fly home for break.
256. A coworker rats on you for being tardy, and you get fired, while they get more hours.
257. The person interviewing you asks an unfair question, and you make a complete fool of yourself.
258. You're interviewing for a competitive internship, and you struggle to answer an inappropriate question.
259. It's your third summer working at your aunt's business, and she gives your friend a raise, but not you.
260. You applied to be manager, but your boss recycles the application in front of you.
261. Another business is suing your company because you have the same name as them.
262. A coworker told you everyone dresses up for Halloween, but when you arrive no one is in costume.
263. Your boss significantly reduces your pay, but there's nothing you can do about it because you're an intern.
264. The night before a deadline, you discover your group member messed up.
265. There was cheating on yesterday's exam, so the professor made a harder exam for everyone to take today.
266. Your coworker doesn't relate changed guidelines, and your boss berates you for completing the project incorrectly.
267. You ask a coworker to deliver your final project to your boss, but they misplace it.
268. A coworker doesn't do their part of an assignment and causes you to miss an important deadline.
269. You realize your friend told you the wrong due date as everyone else hands in their essay.
270. Your professor asks for take-home midterms, and you realize you left yours at home.
271. Your professor assigns extra busy work the day before your oral exams.
272. Your group project member plays hooky, and you miss the deadline to complete your final project.
273. Your internship boss is requiring you work longer hours, and they will fire you if you don't.
274. Your boss had to fire your work team, and now you have to cover all the bases.
275. Your new summer internship just rescinded their offer due to some inappropriate photos they saw on facebook.
276. Your internship boss says you must take on more responsibilities, but they cannot pay you more.
277. Your friend insists you take the "short cut" to school to get your essay in on time, but there's traffic.
278. Your computer crashes, and you don't have a back up of your work because your friend borrowed the flashdrive.
279. The mechanic forgot to refill your car's coolant, and your engine overheats on the highway.
280. Your roommate bumps your desk, knocking your water glass over your computer, and your screen goes black.
281. Your significant other hosts a special party, but you have a take-home midterm due tomorrow morning.
282. A friend calls in a favor, and you are 2 hours late to the first day of your internship.
283. You have to stay late to meet a deadline, but your significant other's birthday dinner started an hour ago.
284. Your internship boss tells you that you need to put in several hours of overtime this week.
285. Your internship boss doesn't give you much work, but on your evaluation they rate your productivity as extremely low.
286. Your internship boss is too busy to answer questions again even though the project deadline is tomorrow.

Materials: Non-stressful Events

287. You watch a mother and child walk past you as you wait for the bus.
288. Your sibling hands over your bike after they're done riding it.
289. You're working to earn extra cash during school, and your boss asks you to hand in next week's availabilities.
290. You arrive at your summer job, and your boss says they will leave early today to catch a flight.
291. Your professor holds the door open while everyone enters class.
292. Your boss is away on a business trip and asks you to send them a weekly update email.
293. Your internship boss hands you the meeting notes for today.
294. Your internship boss puts hand sanitizers on all your workspaces as part of a new company policy.
295. You return home to find your parents decided to replace your bed pillows with other pillows.
296. Your father is in the hospital for a routine checkup and gives you a call from the waiting room.
297. Your mother buys you a magazine for the trip, and you pack it in your bag.
298. You take your parents to see your dorm room and find your roommate has left for the day.
299. Last night you and a sibling sat on the old couch and watched reruns on TV.
300. Your mother calls to ask about your plans for summer break.
301. Your roommate's significant other greets you briefly as they head out the door.
302. Your friend asks a mutual friend if they can borrow their pen for a second.
303. Your significant other says they've decided to head home for their sibling's game this weekend.
304. You walk past a group of people carrying on a conversation.
305. Your best friend tells you they invited a friend from work to watch TV tonight.
306. You tell your parents you're considering taking a class over the summer to free up your fall schedule.
307. You give your professor a doctor's note so that you won't lose points for missing class while you were sick.
308. You've been notified that there will be construction on your drive home, and you call to let your sibling know.
309. You tell your friend that both their parents are on their way over to help set up.
310. You tell your mother the times of your flights for break.
311. Your roommate tells you they got the next round of toilet paper.
312. Your roommate leaves a note for you on the counter.
313. Your mom hands you a plate from the dishwasher, and you put it up in the cupboard.
314. Your roommate gives you the cleaning supplies they bought to put under the sink in the kitchen.
315. Your TA asks you to pass your papers to the left for peer review during today's class.
316. Your professor says they received everyone's work and will hopefully have feedback by next Monday.
317. You type a memo for your boss at work in time to leave for home.
318. You meet with your professor, and they tell you to bring over a chair from the hallway.
319. Your professor requests that everyone staple their papers before handing them in.
320. You and your group member decide to stop working for the day and leave the library.
321. Your significant other tells you they've thinking about getting a new desk chair for their room.
322. You meet your group members after work to start brainstorming ideas for your upcoming mini-project.
323. You and your group partner divide up who will present what at an upcoming informal presentation.
324. You and your group member walk into the meeting room.
325. While completing an in-class exercise your professor makes a brief announcement.
326. You are meeting with a professor, and they tell you they'll be with you in just a second.

327. Your group member answers your email in the afternoon.
328. Your friend asks you to hand them a napkin while you're eating at the table.
329. Your classmate tells you the group meeting is at 1pm in the main library, which works for your schedule.
330. Your teacher gives you a rubric for an assignment that's due at the end of the semester.
331. Your friend accidentally gives the waitress their school ID card instead of their driver's license while you're ordering drinks.
332. You and your roommate decide to give away extra furniture on Craig's list just to get rid of it.
333. You and your friend walk home to your apartment after class.
334. Your friend offers to hold your things while you're giving a stranger directions.
335. Your parents forward some mail to you at school that was mailed to your home address.
336. You arrive at school to see your roommate has left you your fair share of the space.
337. Your roommate tells you they are going away this weekend as well.
338. You arrive back from class to see your roommate working quietly at their desk, as expected.
339. A classmate whispers to you in class about an upcoming assignment.
340. You're sitting at your desk doing homework, and your roommate comes in from picking up books at the library.
341. Your friend tells you about a new spice they used to make dinner last night.
342. Your roommate let a friend sleep on the couch while you were away for the weekend.
343. Your sibling helps you unload your car when you get home.
344. You see your friend before class as you lock your bike to the half-full bike rack.
345. You and your roommate run a quick errand using your car.
346. You come out of the shower and pass by your roommate and their friend making small talk.
347. Your friend asks to borrow your textbook for a second.
348. You and a friend bike past a crowd of people on your way to class.
349. You're talking to a friend on your way to a lecture, and they stop to fix their pant leg.
350. You hand the cashier money at the movie theatre for your ticket.
351. Your professor answers your question in class.
352. Your professor asks everyone to discuss the question with the person next to them before submitting answers.
353. Your group member records ideas for your next class project during your meeting in the library.
354. Your significant other gives you their drink while they run to the bathroom on the next floor.
355. You and your best friend talk about a recent event broadcast on the local news radio station.
356. Your significant other chats to you about today's headlines while you wait for the elevator to open.
357. You say hello to your teacher as you enter class and head for your normal seat.
358. Your friend just told you she's decided to move off campus this semester with her sister.
359. You hand your privacy form to the secretary at the doctor's office and wait to be called.
360. Your parents tell you they got some fresh vegetables from the local grocery store this morning.
361. Your parents ask you what major you've chosen now that you are allowed to designate a major.
362. You borrow your friend's blue pen to sign the paper while you're waiting.
363. At the beginning of class, your professor passes out handouts to help prep for the next exercise.
364. You email a PowerPoint presentation to your group partner so they have it to work on over the weekend.
365. You go to give your significant other a piece of paper, and they take it without question.
366. Your significant other asks you about your old jacket that you left on the chair back.
367. You notice your significant other missed a call from their parents, and you give them their phone.
368. You notice your significant other's eyes trail a stray dog meandering slowly across the street.

369. Your significant other tells you about their new desk at work while you eat a quick breakfast.
370. Your friend asks you about today's weather forecast, and you tell them while you get ready to go.
371. You find an old sock on the floor as you say goodnight to a friend.
372. You arrive at practice, and your coach announces today's routine practice schedule.
373. The university does random flyering in the dorms and the bulletin board outside your shared room gets picked.
374. Your friend is hosting a party, and they ask you to hold the door while they bring in the keg.
375. You bring in a bunch of extra drinks from the kitchen to give your friends at the party.
376. You're at a party, and you and your roommate decide to leave early to save your energy for tomorrow.
377. A friend asks if you'd like to go run some errands with them while you're waiting.
378. Your friend hands you a soda they just poured and decided they didn't want to drink.
379. Your friend passes you the pitcher of water while you're out eating a casual dinner.
380. Your significant other tells you they've decided to trim their hair tomorrow before their last presentation.
381. Your parent calls to ask you the exact time of your departmental graduation ceremony in may.
382. Your friend calls to tell you a mutual high school friend might come to visit them in the city.
383. You and your roommate wake up and head to class at approximately the same time each morning.
384. Your roommate decides to sleep in while you get up to grab some breakfast before class.
385. Your professor tells you they will finish today's topic next time since they didn't get through all the slides.
386. The waiter returns your credit card after he's swiped it to pay for your lunch.
387. Your teacher asks you to pass out handouts in class, and you agree without question.
388. You and one of your group members catch the bus so you can make it to your library meeting.
389. You arrive to class on time, and your professor directs everyone to their designated seats.
390. Your friend hands you your keys that you dropped on the floor on your way out.
391. Your roommate decides to stay at home to watch TV while you decide to buy your groceries for the week.
392. Your friend calls you to let you know they arrived at the airport with plenty of time to spare.
393. You overhear your significant other laughing with their friend about a new TV sitcom they found flipping through.
394. Your friend waits outside with you while you hail a quick taxi.
395. You waited at the bus station this morning so you could ride in with some other people from your complex.
396. You pass a pedestrian you think you might recognize as you drive down the street.
397. You catch another driver's eye as you turn left at a green light on the way home.
398. Your friend asks you to turn up the radio show on your drive in to school.
399. You hand your professor today's 5 min in-class exercise that won't really count for anything but attendance.
400. Your significant other asks you your mother's maiden name so they can fill out the form.
401. You mentioned an upcoming appointment to a friend while you were waiting for the bus this afternoon.
402. Your classmate asks if you've decided on a project topic while you're waiting outside of class.
403. You're TAing a class, and a student asks for clarification on a due date that hasn't been set in stone.
404. Your parents call to let you know they're sending you a package with old clothes you left at home.
405. You see someone buying a quick lunch from a vendor across the street as you walk to school.
406. Your professor is taking attendance, you say 'here' after they call your name, just like every other day.
407. Your professor returns the scrap paper you left in the classroom last week after the exam.
408. Your group member walks back with you from the library because they live in the same area.
409. You and your roommate decide to have a few people over tonight to catch up over food.
410. You see a policeman in his car pass you on the left and pull into the station.

411. You see a police officer while you are driving, and they wave you on by nonchalantly.
412. You offer to give your roommate a ride into class since it's raining and you're driving in anyway.
413. You pass a woman in a parked car as you drive calmly through a school zone.
414. You and your friend head out to the parking lot and hop in your car after class.
415. You look in your rear-view mirror and see someone you might know driving a ways behind you.
416. You're waiting outside before class and a fellow classmate asks what you thought of yesterday's assignment.
417. You return a book to the librarian while you're out running errands you've put off.
418. You are at a crowded concert with a friend, and someone gently brushes past you with apology.
419. You're tutoring a student, and they ask to reschedule tomorrow's session for a little bit later.
420. You often do homework together with one of your friends, and they ask you for clarification on question three.
421. Your parents bring in the mail and leave your pile on the counter by the door.
422. You ask a professor if you can overload into their class, and they agree.
423. You hand your mom some recycling as you answer the phone that's been ringing for a little bit.
424. A professor forwards a message about an upcoming talk to you, and you decide to attend.
425. Your professor puts everyone into groups for the in-class worksheet, and you finish it without trouble.
426. You read along and highlight important points as your professor goes through the class relatively short syllabus.
427. Your professor asks for a vote to see if everyone would like to change the due date of the assignment.
428. You hand the flight attendant your ticket so you can board your flight and find your seat.
429. Your group member sends you an email to schedule a meeting for a convenient time next week.
430. You come into class and your professor asks everyone to sit in alphabetical order.
431. Your professor makes an announcement in class about a new attendance policy that won't really affect much.
432. You pass a group of construction workers while you're riding on your bike, and say a quick hello.
433. Your professor hands out golf pencils for the questionnaire you are to complete by the end of class.
434. Your friend offers to split supplies for the party once you get to the checkout line.
435. The cashier takes your card so they can swipe it to pay for your small purchase.
436. You decide to grab a quick lunch with some classmates after class on Thursday.
437. You and your roommate move the furniture in your living room around to make more space.
438. You give the waiter your credit card to pay for the meal and wait for him to return.
439. Your parents say they will come pick you up on Friday to help cart your belongings home.
440. Your parents call to tell you they're changing the curtains in the house.
441. You ask your mom if you can borrow some extra sheets for the semester.
442. A friend from high school calls to ask about your plans for the upcoming break.
443. Your friend asks what you know about mopeds.
444. You raise your hand to ask a quick question during class, and your professor calls on you.
445. A good high school friend tells you that they have been contemplating colors to paint their bathroom.
446. You get a call that your dad is on his way home from the store.
447. Your dad tells you that he just bought new lawn furniture.
448. Your roommate offers to let your guest use their extra pillows while they stay over on your futon.
449. Your roommate offers to set their alarm for you because yours ran out of batteries.
450. You pick up vitamins from the pharmacist and they hand you a receipt.
451. Your friend stands up against the window and briefly blocks your view of the outside.
452. You go to the doctor for a routine check up.

453. Your roommate asks if they can borrow a bowl for cereal because they broke theirs yesterday.
454. The nurse asks you to roll up your sleeve so they can take your blood pressure at your routine checkup.
455. Your doctor asks you to schedule a routine follow up with the receptionist.
456. The dental hygienist gives you a bag of floss.
457. You pass a landscaper while out running in the neighborhood.
458. Your roommate decided to stay home while you went away last weekend.
459. Your rector announces that the heat will go on in the dorms over the weekend.
460. Maintenance crew members walk past your dorm room.
461. Your landlord tells you they need next month's rent, and you give it to them.
462. You're driving with your roommate, and they ask if they could make a quick stop at the grocery store.
463. You are driving with a friend, and you stop to fill up your gas tank.
464. Your roommate tells you that they cleaned the stove and kitchen sink this morning.
465. You bring your friend's birthday present to the party, and their significant other directs you to the gift table.
466. Your friend comes over to your apartment to ask for milk.
467. The store manager hands you a package of towels to take home.
468. While preparing a meal with a friend, you put the main dish in the oven.
469. Your apartment complex hires extra police during the holidays simply as a precaution.
470. You hand your neighbor mail that was accidentally put in your mailbox instead of theirs.
471. You see your neighbors drinking coffee on their front porch in the morning.
472. Your group member offers to reschedule the meeting for tomorrow.
473. You walk in your dorm room with your parents.
474. You and your roommate pay all the bills for this month.
475. You take care of your friend's dog for the weekend, and they come to pick it up Sunday afternoon.
476. You're walking with your dog, and you pass someone else walking their dog in the opposite direction.
477. You ask your friend to feed your cat while you're away, and they say they will.
478. Your sibling moves your old, discarded fish bowl into their room.
479. You hand your sibling your dog's leash so they can take it for a walk.
480. You take your dog to the vet for a routine check up at the end of the week.
481. The referee asks for captains to come to them at the end of the game.
482. You pass the ball to another player during the pick up game.
483. Your group member calls to ask you about tomorrow's mini-assignment.
484. Your classmate walks into class ahead of you.
485. You and a friend are watching a sporting event, but decide to change the channel.
486. Your mom wants to know when you're switching dorm rooms so they can help you move.
487. Your significant other comes over to your apartment to return a book they borrowed.
488. Your mom calls to ask about granola bars while you're walking home.
489. Your close friend asks if you want to take the same class as them next semester.
490. Your friend walks with you to class Tuesday morning.
491. Your significant other talks to you about the weather.
492. Your professor just passed out lecture notes in preparation for the next class.
493. Your friend says they know the way to the party, and they take the lead.
494. You just received notice that the office obtained your financial aid information and you are set.

495. Your friend gives you directions to the grocery store, and you grab a pen to write them down.
496. You drive your friend through the quiet downtown on the way to the store.
497. Your friend gives you directions to come pick them up.
498. Your uncle asks how school is going while you're both at a family party.
499. Your parents tell you there was a local news story done on French doors in your hometown.
500. Your parents call to tell you they bought a new fridge.
501. Your roommate has started doing work regularly inside your room because it's too cold to walk to the library.
502. Your roommate borrowed your textbook over the weekend while you didn't need it.
503. You're at a restaurant and the table next to you orders the same food as your table by coincidence.
504. A patron at the bar politely asks if you could move over so they can get a drink.
505. You see a man holding a grocery bag filled with household cleaning items.
506. Your professor decides to add an in-class exercise to today's class so everyone will fully understand the topic.
507. You file in line at the front of class to hand in your essay to your professor.
508. You and your group member sign up for a class meeting time at the end of class.
509. The student sitting in front of you in class leans back to give you the handouts.
510. You give a campus visitor directions to the new bookstore.
511. You talk privately with your professor about some pleasant comments they wrote on your paper.
512. Your significant other says they forgot their bag at your place, and they'll come grab it tomorrow morning.
513. Your roommate puts your bags in the back of the huge trunk of their car at the airport.
514. You drive your sibling to pick up toiletries at a nearby store.
515. You and your friend are running an errand and stop on the way for gas.
516. Your coworker asks to borrow a piece of paper to take notes during the meeting.
517. You and your group member pick days to meet for next week to discuss the upcoming project.
518. Because of a talk between you and a coworker, they decide to order a tennis racket.
519. You make an offhand remark about the color of the trees to your coworker.
520. You and your coworker grab extra chairs for this morning's meeting.
521. Before your parents drop you off, they tell you they have to stop for a few food staples.
522. You ask you sister about her newly posted "in a relationship" status on facebook when she calls to catch up.
523. Your sister asks about your class schedule for this semester while you're out walking together.
524. You overhear your sibling talking to their significant other in the yellow room next door.
525. Your parents start to chat after your youngest sibling goes to bed early in the upstairs room.
526. Your sibling asks to borrow your water-shoes for a few minutes while they swim in a rocky area.
527. Your significant other calls to ask when you'd like to get together tomorrow after work.
528. Your friend calls your significant other to ask if you'd both like to come over to hang out.
529. Your significant other says hi to your roommate when they come home from a long class day.
530. A casual friend texts you to offer their opinion on easy to build dorm room lofts.
531. Your partner comments on the movie theatre seats as you walk into the dimly lit room.
532. Your friend asks if you'd recommend a certain restaurant to take family to when they're in town next weekend.
533. Your housemate asks if you mind if their brother sleeps on the couch while he's visiting this weekend.
534. You ask the waitress for some extra napkins while you're eating out at a local restaurant.
535. A waiter hands you a menu as you walk into the restaurant and to your booth.
536. Your significant other decides to buy some bread for tonight's potluck meal with your friends.

- 537. Your significant other asks you for today's paper, and you give them the section you finished reading.
- 538. You grab a drink from a friend while you're out at a random party.
- 539. Your significant other asks you to hand them their sneakers while you're in the hallway.
- 540. You hand a friend some money to grab you a drink while they're up at the bar.
- 541. You and a friend decide to shelve library books one night a week to make a little extra money.
- 542. You and a coworker sign up for similar hours next weekend, which should work out just fine.
- 543. You and a group member fill out a quick form online while your roommate talks on the phone.
- 544. You're in a meeting, and someone asks your boss a question about the new conference room chairs.
- 545. Over the summer you and a friend decide to work a couple days a week for your aunt.
- 546. You give your boss your time sheet for the past two weeks and grab a new one.
- 547. You get a call from a non-competing business to see if they can advertise in your storefront.
- 548. The secretary at your new job asks you to help them post a few holiday party flyers.
- 549. Your internship boss gives you the work schedule you expected for the next couple of weeks.
- 550. A month before the project is due, you and your group members equally divide up the work.
- 551. Your professor announces they noticed nearly everyone was in class yesterday and today.
- 552. You and a summer internship coworker work on a project that's not due until December 15th.
- 553. You asked a nearby coworker to hand you the grey stapler from their desk.
- 554. A coworker offers to grab a snack for you while they're on a break in the afternoon.
- 555. Everyone hands in their assignments at the beginning of class while the professor writes upcoming deadlines on the board.
- 556. Your professor asks everyone to talk amongst themselves while they take a quick phone call outside.
- 557. Your professor cancels a "busy work" in-class assignment at the beginning of class.
- 558. Your group project member asks how you'd prefer to divide up the work so you meet the deadline.
- 559. Your internship boss asks to discuss your work schedule with you so they can coordinate.
- 560. Your boss assigns you to the next work team at the start of the first quarter.
- 561. Your summer internship mails some paperwork for you to fill out before you come next month.
- 562. Your internship boss asks you to sign a very reasonable agreement about your responsibilities at work.
- 563. Your friend asks if you can drop them off at their building so they can hand in their assignment.
- 564. Your friend asks if they can borrow your flashdrive for a second so they can transfer some files.
- 565. You and a coworker decide to carpool to your summer internship for the next few months.
- 566. Your roommate comes over to your desk to look at your textbook while you're working on something else.
- 567. Your significant other calls to see if you'd like to hang out after you finish your take-home assignment.
- 568. You give your ID card to the office secretary so they can clock you in while the system is down.
- 569. You give the secretary a memo to distribute to everyone next week before the meeting.
- 570. Your internship boss tells you that they will need to move your desk over a few feet.
- 571. Your summer internship boss hands out extra paper clips so everyone is properly supplied for the next few weeks.
- 572. Your internship boss says they will answer your email about the water cooler tomorrow after the meeting.

Procedure: Rating Questions

Group 1. Experience

Experience (Exper)

Have you ever experienced this or a similar situation yourself?

(-1 to 1 scale: -1 = no, 0 = uncertain, 1 = yes)

Familiarity (Fam)

How familiar are you with this scenario based on having experienced it?

(1-7 scale: 1 = no, 4 = average, 7 = high)

Vicarious Familiarity (VicFam)

How familiar are you with this scenario based on vicarious experience

(present when someone else experienced it, read about it, seen it on TV, heard someone else talk about it etc.)?

(1-7 scale: 1 = no, 4 = average, 7 = high)

Group 2. Perceived Stress and Plausibility of Experience

Perceived Stress (PerStr)

If you were actually in this scenario, how much stress would you experience?

(1-7 scale: 1 = low, 4 = medium, 7 = high)

Being There (BeTh)

From reading the description above, how much can you imagine actually “being there” in the scenario and vividly experiencing what’s taking place?

(1-7 scale: 1 = none at all, 4 = moderate, 7 = high)

Plausibility (Plaus)

How likely do you think it would be that you would find yourself in this situation?

(1-7 scale: 1 = none at all, 4 = moderate, 7 = high)

Group 3. Basic Conditions for Stress and Perseveration

Expectation Violation (ExpVio)

If you were in this scenario, to what extent does it violate your expectations about what's supposed to happen when people are acting reasonably?

(1-7 scale: 1 = none at all, 4 = moderately, 7 = highly)

Self Threat (SlfThr)

If you were in this scenario, how threatened would you feel (physically, psychologically, socially etc.)?

(1-7 scale: 1 = none at all, 4 = moderately, 7 = highly)

Efficacy (Effic)

If you were in this scenario, to what extent do you believe that you would be able to cope effectively with the situation?

(1-7 scale: 1 = none at all, 4 = moderate, 7 = high)

Perseveration (Persevv)

If you were in this scenario, to what extent would you continue to worry about this situation until it was resolved?

(1-7 scale: 1 = none at all, 4 = moderate, 7 = high)

Group 4. Imagery and Bodily Experience

Visual Imagery (VisIm)

As you read this scenario, how much visual imagery related to it do you experience?

(1-7 scale: 1 = none at all, 4 = moderate, 7 = high)

Bodily Experience (BodExp)

As you read this scenario, how much internal bodily experience do you have (arousal, changes in heart rate, breathing, muscle tension etc.)? (1-7 scale: 1 = none at all, 4 = moderate, 7 = high)

Action Imagery (ActIm)

As you read this scenario, how much do you imagine actions you could perform?

(1-7 scale: 1 = none at all, 4 = moderate, 7 = high)

Verbal Imagery (VrbIm)

As you read this scenario, to what extent do you hear verbalizations(your own or other people's)?

(1-7 scale: 1 = none at all, 4 = moderate, 7 = high)

Group 5. Valence and Arousal

Positive Valence (PosVal)

If you were in this situation, how much positive emotion would you experience?

(1-7 scale: 1 = none, 4 = medium, 7 = high)

Negative Valence (NegVal)

If you were in this situation, how much negative emotion would you experience?

(1-7 scale: 1 = none, 4 = medium, 7 = high)

Arousal (Arous)

If you were in this scenario, how much bodily arousal would you experience? *

(1-7 scale: 1 = none, 4 = medium, 7 = high)

Group 6. Certainty

Situation Certainty (SitCer)

How certain are you about what's really going on in this situation?

(1-7 scale: 1 = very uncertain, 4 = somewhat certain, 7 = very certain)

Coping Certainty (CopCer)

How certain are you about what you would do to handle the situation?

(1-7 scale: 1 = very uncertain, 4 = somewhat certain, 7 = very certain)

Outcome Certainty (OutCer)

How certain are you about what the eventual outcome of the situation would be?

(1-7 scale: 1 = very uncertain, 4 = somewhat certain, 7 = very certain)

SM Table 1. Complete correlation matrix

	Exper	Fam	VicFam	BeTh	Plaus	ExpVio	SlfThr	Effic	Persev	VisIm	BodExp	ActIm	VrbIm	PosVal	NegVal	Arous	SitCer	CopCer	OutCer
PrcStr	-.49**	-.43**	-.09**	-.06**	-.46**	.67**	.78**	-.72**	.82**	-.15**	.62**	-.05**	.01	-.46**	.85**	.63**	-.46**	-.65**	-.65**
Exper		.84**	.34**	.27**	.59**	-.43**	-.46**	.40**	-.48**	.17**	-.33**	.12**	.07**	.32**	-.48**	-.33**	.34**	.43**	.44**
Fam			.50**	.34**	.63**	-.40**	-.40**	.36**	-.43**	.18**	-.26**	.13**	.09**	.24**	-.44**	-.33**	.36**	.43**	.44**
VicFam				.30**	.32**	-.18**	-.09**	.11**	-.12**	.16**	.08**	.18**	.21**	-.05**	-.11**	-.18**	.17**	.17**	.19**
BeTh					.54**	-.12**	-.06**	.09**	-.07**	.27**	.00	.26**	.20**	.01	-.07**	.04**	.16**	.14**	.15**
Plaus						-.45**	-.44**	.41**	-.48**	.22**	-.34**	.18**	.11**	.35**	-.47**	-.31**	.37**	.42**	.44**
ExpVio							.75**	-.68**	.74**	-.05**	.52**	-.08**	-.02	-.44**	.74**	.55**	-.52**	-.60**	-.62**
SlfThr								-.75**	.87**	-.03*	.63**	-.04**	.02	-.46**	.82**	.61**	-.46**	-.61**	-.62**
InEff									-.77**	.06**	-.62**	.03**	-.01	.41**	-.72**	-.48**	.44**	.60**	.59**
Persev										-.07**	.65**	-.05**	.00	-.47**	.85**	.65**	-.49**	-.65**	-.67**
VisIm											.11**	.45**	.14**	.07**	-.09**	-.02	.12**	.14**	.15**
BodExp												.20**	.21**	-.42**	.65**	.46**	-.34**	-.48**	-.46**
ActIm													.29**	.06**	-.05**	.06**	.09**	.06**	.07**
VrbIm														.01	.00	.03*	.02	-.02	.01
PosVal															-.45**	-.19**	.27**	.35**	.35**
NegVal																.67**	-.51**	-.68**	-.68**
Arous																	-.35**	-.45**	-.53**
SitCer																		.69**	.67**
CopCer																			.83**

Note. The *N* of each cell = 6864. ** Correlation is significant at the $p < .01$ level (2-tailed). * Correlation is significant at the $p < .05$ level (2-tailed). PrcStr is perceived stress, Exper is experience, Fam is familiarity, VicFam is vicarious familiarity, BeTh is being there, Plaus is plausibility, ExpVio is expectation violation, SlfThr is self threat, Effic is efficacy, Persev is perseverance, VisIm is visual imagery, BodExp is bodily experience, ActIm is action imagery, VrbIm is verbal imagery, PosVal is positive valence, NegVal is negative valence, Arous is arousal, SitCer is situation certainty, CopCer is coping certainty, OutCer is outcome certainty.